THE OHIO JOURNAL OF SCIENCE

VOL. XLIII JULY, 1943 No. 4

ANNUAL REPORT OF THE OHIO ACADEMY OF SCIENCE 1943

THE OHIO ACADEMY OF SCIENCE

Organized 1891 Incorporated 1892

Affiliated with the American Association for the Advancement of Science

OFFICERS AND COMMITTEES FOR 1943–1944

President

H. C. SHETRONE

Vice-Presidents

A. *Zoology:* H. R. EGGLESTON
B. *Plant Sciences:* FREEMAN S. HOWLETT
C. *Geology:* JOHN W. WELLS
D. *Medical Sciences:* E. W. E. SCHEAR
E. *Psychology:* A. C. ANDERSON
F. *Physics and Astronomy:* E. H. JOHNSON
G. *Geography:* C. C. HUNTINGTON
H. *Chemistry:* H. J. GARBER
I. *Mathematics:* R. E. MANCHESTER
J. *Junior Academy:* PHILIP DYE
K. *Anthropology:* WILLIAM LIPKIND

Secretary

A. W. LINDSEY

Treasurer

CLARENCE E. TAFT

Historian

WILLIAM H. ALEXANDER

Executive Committee

Ex-Officio: H. C. SHETRONE, A. W. LINDSEY AND C. E. TAFT
Elective: EUGENE VAN CLEEF AND GLENN W. BLAYDES

Trustees of the Research Fund

HERBERT OSBORN, *Chairman*, term expires.....1944
F. C. BLAKE, term expires.....1945
M. E. STICKNEY, term expires.....1946

Library Committee

MRS. ETHEL M. MILLER, *Chairman*

Librarian in charge of Academy Exchanges and Publications

WARREN P. SPENCER, term expires.....1944
WILLIAM LLOYD EVANS, term expires.....1945

*Committee on Conservation**

G. W. CONREY, term expires.....1944
PAUL B. SEARS, term expires.....1944
E. L. WICKLIFF, term expires.....1944
E. LUCY BRAUN, term expires.....1945
E. S. THOMAS, term expires.....1945
WILBER STOUT, term expires.....1945
ROSCOE W. FRANKS, term expires.....1946
T. H. LANGLOIS, *Chairman*, term expires.....1946

Committee on Nominations for 1943–1944

THE VICE-PRESIDENTS OF 1942–1943—ROBERT M. GEIST, *Chairman*

Membership Committee for 1943–1944

A. *Zoology:* MARION BOESEL, *Chairman*
B. *Plant Sciences:* W. E. STEIDTMANN
C. *Geology:* H. A. IRELAND
D. *Medical Sciences:* L. F. EDWARDS
E. *Psychology:* ARTHUR G. BILLS
F. *Physics and Astronomy:* C. W. JARVIS
G. *Geography:*†
H. *Chemistry:* R. G. BOSSERT
I. *Mathematics:* E. I. YOWELL
J. *Junior Academy:* NELSON CRITES
K. *Anthropology:* RICHARD G. MORGAN

Academy Representatives

1. On the Joint Administrative Board of the Ohio Journal of Science:
   WARREN P. SPENCER, term expires.....1944
   WILLIAM LLOYD EVANS, term expires.....1945
2. On the Council of the A. A. A. S.: A. W. LINDSEY.
3. On the Save-Outdoor-Ohio Council: ROSCOE W. FRANKS.

The Council for 1943–1944

ANDERSON, A. C.
BILLS, ARTHUR G.
BLAYDES, GLENN W.
BOESEL, MARION
BOSSERT, R. G.
CRITES, NORMAN
DYE, PHILIP
EDWARDS, L. F.
EGGLESTON, H. R.
EVANS, WILLIAM LLOYD
GARBER, H. J.
HOWLETT, FREEMAN S.
HUNTINGTON, C. C.
IRELAND, H. A.
JARVIS, C. W.
JOHNSON, E. H.
KRECKER, F. H.
LANGLOIS, T. H.
LINDSEY, A. W.
LIPKIND, WILLIAM
MANCHESTER, R. E.
MILLER, JOHN A.
MORGAN, RICHARD G.
OSBORN, HERBERT
SCHEAR, E. W. E.
SHETRONE, H. C.
SPENCER, WARREN P.
STEIDTMANN, W. E.
TAFT, C. E.
VAN CLEEF, EUGENE
WELLS, JOHN W.
YOWELL, E. I.

*One of the three names presented by the nominating committee for membership on this committee does not appear in the membership list of the Academy, hence only two members serving until 1946 can be included at present.

†The Vice-President-elect of Section G found it impossible to accept the office, hence the membership committeeman has been advanced to the vice-presidency, leaving his post to be filled.

REPORT OF THE FIFTY-THIRD ANNUAL MEETING OF THE OHIO ACADEMY OF SCIENCE

The Council thought seriously this year of suspending the annual meeting because of the war, but finally decided that organizations of lesser geographic extent could fill an even more important place while national groups are so generally abandoning their meetings. The annual meeting was therefore planned to take place on the campus of the Ohio State University on the last two days of April and the first of May, 1943.

The session opened with a meeting of the Executive Committee at 2:30 P. M., April 29, followed by the annual meeting of the Council.

In place of the Thursday evening lecture presented in recent years, the Academy accepted the invitation of the local chapter of the Society of the Sigma Xi to attend a lecture by Professor Peter Debye of Cornell University on "The Magnetic Approach to the Absolute Zero of Temperature," and the invitation of the Columbus Audubon Society to hear Dr. Donald J. Borror of the Ohio State University in a lecture on "How to Identify Birds."

The sectional meetings occupied Friday. The Mathematics Section presented no program, since mathematicians of the region had already shared in a meeting earlier in April, and the Physics Section did not meet independently because of the opportunity to participate in the program of the American Physical Society. The Junior Academy presented its usual excellent program on the following day. With these exceptions Friday's programs surpassed the Council's expectations and provided ample proof of the worth of state meetings under existing conditions. The printed program shows a total of 95 papers varying in length from ten minutes to an hour, and three symposia, one a general meeting on conservation and two in the sections of geography and chemistry on the special problems of wartime teaching.

In addition to this portion of the program, the Ohio State Museum presented a number of interesting special exhibits.

The banquet was served in the Faculty Club to approximately one hundred members. Dr. Roderick Peattie, as toastmaster, presided genially, presenting first, President Howard L. Bevis of the Ohio State University in a brief greeting. In a week flooded with such occasions, President Bevis graciously divided his evening between the Physical Society and the Academy. Dr. Clarence Ward of Oberlin College responded for the Academy in the cultured and scholarly manner that his friends know always to expect from him.

Following the excellent dinner President Krecker delivered his retiring address on "Woods and Trees," emphasizing brilliantly the broader opportunities of his field, biology, and painting an optimistic picture of the future of man.

In the annual business meeting the one amendment to the constitution was adopted, creating a new class of Honorary Life Members, and three members were elected to the new rank under suspension of the time limit cited in the amendment. These members are:

Alexander, William H.
Moseley, E. L.
Osborn, Herbert.

Dr. S. R. Williams read a brief statement in place of the finished report of the Committee on Necrology to be supplied later for publication.

The report from the Council, read by the Secretary, included a list of thirty-three new members and thirteen fellows. Those elected to fellowship are:

Bills, Arthur G.
Caster, Kenneth E.
Cole, L. E.
Cooper, John R.
Dexter, Ralph W.
Hendrickson, Gordon
Mathews, C. O.
Miller, Joseph N.
Rieveschl, George, Jr.
Scofield, Herbert T.
Steckle, Lynde C.
Vaughn, James
Warner, Edward N.

Dr. Ira Wilson presented the report of the Committee on Resolutions, expressing the Academy's appreciation to our hosts for a very successful, pleasant and ably managed meeting.

Respectfully submitted,

A. W. Lindsey, *Secretary.*

REPORT OF THE TREASURER

COLUMBUS, OHIO, May 3, 1943.

To the Ohio Academy of Science:

I submit herewith a financial statement of the condition of the Ohio Academy of Science as of December 31, 1942. The books have been audited and the opinion of the auditor is herewith attached.

Respectfully submitted,

CLARENCE E. TAFT, *Treasurer.*

EXHIBIT A

OHIO ACADEMY OF SCIENCE BALANCE SHEET AS AT DECEMBER 31, 1942

ASSETS

CURRENT EXPENSE FUND:		
Cash on Hand		$ 20.00
Cash in Bank		1,008.67
Total Cash		$1,028.67
DUES RECEIVABLE:		
1939	$ 25.00	
1940	95.00	
1941	217.50	
1942	412.50	
Total Dues Receivable		750.00
Interest Receivable		19.50
Bonds—Consolidated Federal Farm Loan		1,300.00
Total Assets—Current Expense Fund		$3,098.17
RESEARCH FUND:		
Cash in Bank	$ 284.78	
Capital Stock—Banc-Ohio Securities Company (cost)	437.50	
Bonds—Fort Hayes Hotel, Columbus, Ohio (cost)	1,300.00	
Total Assets—Research Fund		2,022.28
TOTAL ASSETS		$5,120.45

LIABILITIES, DEFERRED CREDITS AND NET WORTH

LIABILITIES:		
Accounts Payable (Subscriptions Journal of Science)		$ 750.00
DEFERRED CREDITS TO INCOME:		
Reserve for Uncollected Dues Receivable	$ 750.00	
1943 Dues Collected in 1942	20.00	
Total Deferred Credits to Income		770.00
Total Liabilities and Deferred Credits to Income		$1,520.00
NET WORTH:		
Ohio Academy of Science:		
Current Expense Fund—Surplus	$1,478.17	
Reserve for Investment	100.00	
Total Net Worth—Current Expense Fund	$1,578.17	
Research Fund—Surplus	2,022.28	
Total Net Worth (Schedule 1)		3,600.45
TOTAL LIABILITIES, DEFERRED CREDITS AND NET WORTH		$5,120.45

EXHIBIT B

Ohio Academy of Science Statement of Income and Expense

Current Expense Fund

For the year ending December 31, 1942

Income:		
Dues for the year 1942		$1,287.00
Grants for Research		157.50
Sale of Publications		38.09
Gift for Investment		100.00
Interest on Bonds		39.00
Total Income		$1,621.59
Operating Expenses:		
Clerical Assistance	$ 25.00	
Postage and Telegraph	110.46	
Office Supplies and Expenses	.83	
Expenses—Officers to Meetings	24.59	
Expenses—Speakers	25.00	
Printing:		
Proceedings of Ohio Journal of Science	$233.24	
Other	126.92	
	360.16	
Research Grants	157.50	
Subscriptions to Ohio Journal of Science	750.00	
Secretary's Honorarium	100.00	
Safety Deposit Box Rent	3.60	
Bond for Treasurer	5.00	
Auditing Expense	15.00	
Bank Charges	6.96	
Total Operating Expenses		1,584.10
Net Operating Income		$ 37.49
Other Income:		
Dues Collected for Prior Years:		
1939	$ 17.50	
1940	62.50	
1941	122.50	
Total Dues Prior Years		202.50
Net Income for the Year		$ 239.99

EXHIBIT C

Ohio Academy of Science Statement of Cash Receipts and Disbursements (Current Expense Fund)

For the year ending December 31, 1942

Cash Balance—December 31, 1941		$ 262.43
Deposits for the Year:		
Dues 1939	$ 17.50	
Dues 1940	62.50	
Dues 1941	122.50	
Dues 1942	1,258.00	
Dues 1943	20.00	
Research Grants	157.50	
Federal Farm Loan Interest Coupons	58.50	
Sale of Publications	38.09	
Gifts and Grants for Investment	100.00	
Total Deposits, 1942		1,834.59
Total Cash to be Accounted for		$2,097.02
Disbursements (Checks Written):		
Accounts Payable	$234.25	
Clerical Assistance	25.00	
Postage	110.46	
Office Expense and Supplies	.83	
Expense of Officers to Meetings	24.59	
Printing	360.16	
Research Grants	157.50	
Secretary's Honorarium	100.00	
Speakers Honorarium	25.00	
Safety Deposit Box	3.60	
Bond for Treasurer	5.00	
Auditing Expense	15.00	
Bank Charges	6.96	
Total Disbursements		1,068.35
Cash Balance—December 31, 1942		$1,028.67
Cash on Hand—December 31, 1942		$ 20.00
Cash in Bank—December 31, 1942		1,008.67
Total Cash		$1,028.67

AUDITOR'S CERTIFICATE

Columbus, Ohio, May 1, 1943.

The Ohio Academy of Science,
Columbus, Ohio.

Gentlemen:

In accordance with your instructions, I have audited the accounts and records of the Treasurer of the Ohio Academy of Science for the year ended December 31, 1942.

I did not audit the accounts shown in the Research Fund. They are presented as submitted by Dr. Herbert Osborn to the Treasurer of the Ohio Academy of Science.

Subject to the foregoing qualification and based upon such examination, in my opinion the accompanying Balance Sheet, Statement of Income and Expense, and supporting statements and schedules fairly present the financial position of the Ohio Academy of Science at December 31, 1942, and the results of operations for the year ended on that date.

Respectfully yours,

Daniel M. Shonting,
Certified Public Accountant.

REPORT OF THE TRUSTEES OF THE RESEARCH FUND

The Research Fund of the Academy had a balance of $210.53 in the checking account at the beginning of the year 1942 and as no grants were made from this fund and additions amounted to $74.25, the balance on deposit at the Ohio National Bank was $284.78.

Summary of Receipts and Assets

Balance in Bank as of December 31, 1941	$ 210.53
Receipts from Interest, etc.	74.25
Total	$ 284.78
Disbursements	0.00
Balance in Checking Account December 31, 1942	$ 284.78

Assets

Bonds (at cost)	$1,300.00
BancOhio Stock (at cost)	437.50
Cash on Deposit, Ohio National Bank	284.78
Total	$2,022.28

The grant of $152.00 from the A. A. A. S. for 1942 was by approval of the trustees allotted to Drs. Wolfe, Scofield and Wareham for continuation of their microclimatic studies in Hocking County and a similar grant from the A. A. A. S. for 1943 of $172.00 has been allotted by our approval, $100.00 to Drs. Wolfe, Scofield and Wareham for further continuation of their project in Hocking County, and $72.00 to Dr. Carl Venard for studies of the mosquito populations in Ohio.

It should be noted that the allowances from the A. A. A. S. are expected to be allotted and spent within the year and as these allotments are made on approval of the Trustees of the Research Fund, applications are desired in advance for the anticipated allowance for 1944.

The addition of $36.50 to the balance of last December from later receipts gives us a balance of $321.28 on deposit and unless there are requests for grants for worthy projects from the Academy fund it would seem desirable to invest a part of this balance and we would suggest purchase of U. S. War Bonds if approved by the Academy.

Respectfully submitted,

Herbert Osborn, *Chairman*,
Paul B. Sears,
F. C. Blake.

Trustees

REPORT OF THE EXECUTIVE COMMITTEE AND COUNCIL

The Executive Committee held two meetings during the year, one on November 21, 1942, and one on April 30, 1943, just preceding the annual meeting of the Council, whose first meeting took place on January 16. Since actions of the Executive Committee other than minor routine details are presented to the Council for action, the following report may embrace the significant transactions of both groups.

The discussion of the desirability of an annual meeting of the Academy was brought to an affirmative end that seems to have been amply justified. We may anticipate the continuation of these meetings during the war.

During the year the Academy received a bequest of $100.00 from the estate of Hermine Z. Hansen. The Council approved the addition of $12.50 to this sum, $11.00 of which was used, the total to be invested in Victory Bonds of $150.00 face value.

At the first meeting of the Council a suggestion from the Botany Section that its name be changed to the Plant Science Section was approved. The Section voted this change at its annual meeting.

A proposal from President Krecker to extend the interest of the Academy in Conservation to the human species was discussed in both meetings of the Council, culminating in the approval of a committee to work on the subject during a period of five years. For this period the com-

mittee is to consist of Dr.L . H. Snyder as chairman, Dr. R. A. Hefner, Dr. W. P. Spencer, and two other members, one a physician, to be appointed by the president. This committee is to be a pioneer organization in surveying the possible field of activity, and is to report to the Council at its next annual meeting. At the end of the five-year period it is hoped that the committee may suggest plans for its own future.

The Council also considered the problem of investment of permanent funds and asked the Treasurer, aided by one other member, to study the subject in the interest of security and satisfactory yield for the benefit of our membership.

An important attainment of the year is the settlement of the long-standing discrepancy in the publication accounts of the Academy and the Ohio Journal of Science and in the establishment of definite regulations for the future. These regulations provide that members in arrears at the time of the annual meeting, or on May 1 if no meeting is held, shall be dropped from the mailing list of the Journal until arrears are paid.

The Council voted unanimously to carry with deferred memberships all members of the armed services of the United States for the duration of the war. Dues will not be charged during this period and the members concerned may resume their active membership when they return to civilian life by paying the dues current at that time.

The Council calls attention of all members to the prosperous condition of our research fund, with a balance of over $300.00 subject to application in addition to approximately $150.00 available annually from the A. A. A. S. Applications for grants should be addressed to Dr. Herbert Osborn, Chairman of the Trustees of the Research Fund, who may be reached during the summer and early autumn at the Ohio State University.

The Council also adopted a provision that sections failing to participate in three successive meetings of the Academy shall be dropped, since such a failure may be taken to indicate that the members feel no need for the organization.

Respectfully submitted,

A. W. Lindsey, *Secretary.*

REPORT OF THE JOINT ADMINISTRATIVE BOARD OF THE OHIO JOURNAL OF SCIENCE

Columbus, Ohio, April 3, 1943.

To the Ohio Academy of Science:

The annual meeting of the Joint Administrative Board of the Ohio Journal of Science was held at the Ohio State University April 3, 1943. Present were Drs. Snyder and White, representing the Ohio State University; Drs. Spencer and Ray, representing the Academy; and Drs. Blaydes and Miller, representing the Journal. In the absence of the Chairman, Dr. Patrick, Dr. Spencer nominated Dr. Snyder to act as Chairman; seconded by Dr. Ray. The motion carried.

Dr. Snyder called the meeting to order at 11:00 A. M. The minutes of the preceding meeting were read and approved.

The editor's report, given by Dr. Blaydes, included an analysis and summary of the manuscripts on hand. Thirty-three papers have been accepted and are available for publication. In addition manuscripts of special interest are being solicited with plans to include them in forthcoming issues.

The following motion was presented by Dr. Ray and seconded by Dr. Snyder:

Upon the receipt of an acceptable paper from an Ohioan, who is not a member of the Academy, the editor shall enclose a membership blank along with the acceptance of the paper.

The motion was carried.

The acceptance of the editor's report was moved by Dr. Ray and seconded by Dr. Spencer. The motion was carried.

The business manager's report was given by Dr. Miller. The financial statement follows:

THE OHIO JOURNAL OF SCIENCE—FISCAL YEAR 1942

RECEIPTS

Balance from 1942	$ 186.43
University Allowance	750.00
Ohio Academy of Science—pro rata of Dues	611.00
Ohio Academy of Science—Proceedings	233.24
Subscriptions	83.00
Sale of Back Numbers	43.75
Author's Payments for Plates	130.20
Payment by Author of Publication Costs	40.00
	$2,077.62

EXPENDITURES

Spahr and Glenn Co., Printing Vol. 42 and Envelopes and Stationery	$1,530.10
Bucher Engraving Company	286.42
Postmaster	41.19
Bank Charges	3.94
Refund to Franklin Square Agency	.68
	$1,862.33
Balance on hand January 28, 1942 (Huntington National Bank)	215.29
	$2,077.62

Drs. Snyder and White were appointed as auditors. Dr. Spencer moved the acceptance of the business manager's report; seconded by Dr. White. The motion was carried.

A motion by Dr. Ray; seconded by Dr. White, was that Drs. Snyder, Blaydes, and Miller be empowered to select an assistant business manager. The motion was carried.

The committee adjourned at 2:00 P. M.

Respectfully submitted,

JOHN A. MILLER,
Secretary of the Board.

REPORT OF THE LIBRARY COMMITTEE

COLUMBUS, OHIO, April 27, 1943.

To the Council of the Ohio Academy of Science:

The past year has been so uneventful in library work that it has not even been necessary to bring any matters to the attention of the other members of this committee. Claiming numbers of journals that failed to arrive, posting individual issues of our own journal, keeping the mailing list correct, and making a few sales have been about the extent of the work during the entire year.

The sales of publications amounted to $31.15 including tax. This sum, with an itemized statement, has been given to the Treasurer. One sale was for more than $22.00, as a southern university which owned a few scattered numbers of the Proceedings purchased all the remaining numbers in order that it might have a complete set. Thirteen other sales were made, consisting of sixteen copies of eight different Special Papers. Eight of the fourteen sales were to people in Ohio and one each of these places, Connecticut, New York, Washington, D. C., Louisiana, Michigan, and Wisconsin. The sales have been increasing somewhat each year since the all-time low of $7.65 in 1939.

Last year the members of this committee considered ways to circulate more of the stock of the Academy publications. Two plans were suggested and the results were to be reported this year. One plan was to send the price list to book dealers, as it had been some years since this had been done. Accordingly a new list was mimeographed and copies were posted to thirteen dealers, but with no results so far. The other plan was to make use of the new Union List of Serials which was to appear in the summer of 1942, in order to ascertain the various numbers of the Proceedings which were lacking in the libraries listed in it and offer to supply them on a sale or an exchange basis as the case might be. As the publication of the new Union List was postponed, this plan could not be carried out, but it will be whenever the List is published and its results will be reported to the Council.

Very few foreign exchanges are being received and on our part we are not posting the Ohio

Journal of Science outside our own country except to Canada. New exchanges have been received during the year from Mexico City, San Salvador, and Harvard University.

Respectfully submitted,

ETHEL MELSHEIMER MILLER, *Chairman.*

REPORT OF THE COMMITTEE ON NECROLOGY

To the Ohio Academy of Science:

Our roster of members has been depleted during the closing academy year by the decease of six members; one of whom had been a member about thirty years, one about twenty years, three about ten years, and one only one year. Each is a distinct loss to science and to the Academy. The youngest, Dr. Pierstorff, was born in 1895, Dr. Inman five years earlier. Messrs. Mathewson and Matheny were each about sixty, and Mr. Chase and Miss Nichols seventy.

SUSAN PERCIVAL NICHOLS was born in Maine in 1873, completed her public school and was graduated from Cornell University in 1898. She was a fellow in Botany at Cornell the next year and had an American University Woman's table at Naples Zoological Station. After two years of teaching at Houghton Seminary, New York, she was a fellow at Wisconsin, 1902–03, and was given the Ph.D degree there in 1904. For four years she taught in a private school in Kentucky and then began her life work as instructor in Botany in Oberlin College. She rose through the ranks to a professorship in 1925, and after several years as head of her department, retired in 1938.

Dr. Nichols was modest and retiring, a keen observer, a skillful technician in spite of the physical handicap of a withered arm, an inspiring teacher, a clear thinker and consistent research worker. Although always teaching a full schedule she brought several studies to fruition, presented her results to scientific societies, and published them. These characteristics and performance made a deep impression upon many a student. Her studies at her home in Portland, Maine, on native orchids were interrupted by her death.

Dr. Nichols was for many years an active member of the Ohio Academy (became a Fellow in 1922), of the A. A. A. S., the American Society of Naturalists, and of the Jossylin Botanical Society of Maine.

JOHN H. CHASE was born in Atlanta, Ga., October 25, 1873, where his father was a professor in Atlanta University. He received his B.S. degree from Amherst College and M.S. from Columbia University, after which he became a social worker in New York City. He continued his welfare work in Cleveland and Cambridge, Mass., and about thirty years ago came to Youngstown. He became executive secretary of the Youngstown Playground Association and was through all his work there a pioneer full of good working ideas. He lived to see accepted as necessities many of his "revolutionary ideas."

Better housing, supervised play, better understanding between the Negro and White races, water conservation, tree planting, and various phases of conservation were enthusiastically supported by him. He worked through the schools, Y. M. C. A., Y. W. C. A., Scouts, and Fresh Air camps. He served as president of the Ohio Nature Clubs, and of the Youngstown Nature Study Club and as trustee of the Natural Resources Council.

His zeal and inspiration rose highest when he could interest boys and girls in plants, animals, stars, rocks, minerals, experiments, or play. He was the foremost local authority in Geology and published "Introducing Our Ancestors," "Geology Trails," and many newspaper articles. He had completed a paper on "Earth Rhythms" for the Academy meeting last spring. A few days before the meeting he wrote the chairman of his section, "Because my health is not tops I may not be able to make the trip," and enclosed a copy of his speech. He died in sleep before the day of the meeting.

Youngstown bestowed many honors upon Mr. Chase, not the least being John H. Chase Day in 1935 when 3,000–4,000 persons turned out to do him honor. In his later years he was proud to be chosen professor of Geology in Youngstown College, where he stood strong for field work and actual contact with the things and phenomena of his science.

WILLIAM ALEXANDER MATHENY was born in 1882 here in Ohio. After the regular public school program he entered Ohio University at Athens and received the B.Ph. degree in 1908.

The next year he added the A.M. degree from Clark University and in 1911 his Ph.D. from the same institution. He served as assistant in Botany these three years at Clark. He was invited to teach Botany in his Alma Mater at once and became professor of Civic Biology and Botany at Athens, Ohio, University, in 1912, which position he held until his death of pneumonia January 15, 1943.

He joined the Academy in 1933 and was a member of A. A. A. S. His investigations were in several civic and biologic fields; drink-cup problems, house fly, seed dispersals, and physiologic effects of alcohol.

Stanley B. Mathewson was born in Georgia in 1884. At the age of twenty he was given his B.S. by the Georgia School of Technology, Atlanta. Much of his life work has been in various aspects of personnel and in administrative positions in chemical and industrial institutions. He has served as a District Manager of Bell Telephone and Telegraph Co., as Regiona, Director of the National Labor Relations Board, as a member of the National Research Council and the Vocational Guidance Conference of Economic Security. He was a Major in A. G. Reserves, 1918–39, a member of the American Legion, A. A. A. S., National Audubon Society, and the Florida Audubon Society. He became a member of the Ohio Academy of Science in 1931, Section on Psychology. He was a member of the Episcopalian Church, the Kiwanis and several other clubs. He published several books and papers on Personnel, Labor, Management, and Unemployment Insurance.

Mr. Mathewson had recently retired to Melbourne, Fla. His work brought him in close touch with many men among whom he always moved with ease—welcome in any group.

Ondess Lamar Inman was born in Bloomfield, Ind., November 11, 1890, was given an A.B. by Indiana University, 1915, B.S. by University of Idaho, 1918, and Ph.D. by Harvardl 1921. He held a teaching fellowship and instructorship in Botany at Idaho, 1915–18, and Austin Teaching fellowship at Harvard, 1919–20. Dr. Inman became professor of Biology at Antioch College in 1921, shortly changed to Physiology, and became Dean in 1929, which positions he filled until 1930 when he became Director of the C. F. Kettering Foundation. His main work here was experimental research on chlorophyl. He was a member of A. A. A. S. and Botanical Society of America and joined the Academy in 1923, serving as vice-president in 1935.

Some of his special interests were Respiration injury and recovery processes; Symphalangism; pathogenic bioluminescent bacteria; metabolic studies on *Chlorella clathrata;* chlorophyl and photosynthesis. He prepared a key to the Genus *Calamagrostis*.

While much of his work was done as a member of Antioch College faculty he always wanted time for research and welcomed the call to devote all his time to study and experiment.

Arthur Lewis Pierstorff was born November 12, 1895, and died July 28, 1942. Dr. Pierstorff was graduated from the Ohio State University in 1919 with a degree of Bachelor of Arts, and received the degree of Doctor of Philosophy from Cornell University in 1929. He was a second lieutenant, field artillery, U. S. Army, in 1918.

Dr. Pierstorff was assistant county agent at Rochester and Fredonia, New York, 1921–22; research fellow at Cornell University, 1922–23; plant disease director of the New York State spray service at Cornell University, 1924–26; extension horticulturist at Rutgers University, New Jersey State College of Agriculture, 1926–27; extension plant pathologist and associate professor of botany at the Ohio State University, 1928 38, and associate professor of botany in the same institution from 1938 to the time of his death.

Dr. Pierstorff was a recognized authority in the field of plant pathology and pology. He organized a centralized scab spray service for the state of Ohio, which has been an outstanding service to the orchardists of the state. The effects of his very capable and efficient service in extension work will long continue to be evident in all parts of the state.

Dr. Pierstorff's affable, sincere, and genuine manner, and his warm personality won him many friends among his colleagues and among the agriculturalists of the state.

Our losses always sadden us yet we find satisfaction in contemplating these lives of accomplishment.

Respectfully submitted,

Geo. D. Hubbard.

WOODS AND TREES[1]

FREDERICK H. KRECKER
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Some of you, I am sure, are wondering why a zoologist should presume to discuss a subject which apparently lies within the domain of the botanist. Of course to be strictly zoological I might have used the words formicaries and ants, but no one before me has said, "One can't see the formicary for the ants," and I do not presume to establish a saying.

I have had considerable experience instructing the general arts college student, the student who takes zoology as a college requirement and without thought of continuing in the field beyond the limits of the course. Each year at about this season, after all the tumult and the shouting of instruction have died down, in the wee small hours of the fading academic year, I take stock and ask myself in troubled seriousness, "What have I conveyed to my charges?" Facts, most certainly; but facts without their significance are as food without vitamins. One is filled but does not thrive. Hence, I query, have I been content to show to my students merely the trees of fact, each after each in all their intricacy of detail, or have I also taken them to a vantage point and shown them the beauty and majesty of the forest? Have I, in other words, taken full advantage of the opportunities which President Brown of Denison at our last meeting so eloquently ascribed to the instructors of science. You will remember that in the course of his remarks he humorously itemized the tongue twisting terms that met his gaze as he reviewed the requisitions of his scientific staff. President Brown, however, saw beyond the terms and the facts they represent. He saw them as a means not as ends. Unfortunately some members of our scientific fraternity, not to mention the man in the street, see only the terms. Nothing is so revealing, so pathetically revealing, as the desperate efforts the casual acquaintance makes to find a common ground of conversation once he discovers you are a zoologist. All too often he amusingly, likewise tragically, attempts to recall a name—oh, yes, he says, I studied zoology once. Let me see, what is the name for oysters and clams? . . . That man has seen the trees. I wonder whether he was ever shown the woods; whether he was trained in anything but bare facts. And I wonder too whether, perhaps still more unfortunately, the significance of significances was ever appreciated by his instructors.

The trees and not the woods loomed large in the remarks made by a colleague of mine, a purveyor of the humanities, on the occasion of a round table discussion between a faculty group and students on the ever-recurring topic of science and religion. The immediate question at issue was the relation of scientific facts to religion. My colleague was of the opinion that the two could be in no wise related. By way of illustration he pointed to the facts of meteorology; certain conditions of temperature, moisture, atmospheric movement we know result in rain. How can that knowledge possibly have any connection with religion, he queried. The answer, as we well know, is simple. This certainty of results which the meteorological facts represent takes much of the mystery and consequent uncertainty out of the comings and goings of the weather. To just that extent we feel secure and in harmony with the powers that ride the storm.

My colleague's query did double duty. It revealed the barren trees of both science and religion but the woods of neither. The fundamental yearning which

[1]Address of the retiring president of the Ohio Academy of Science delivered at the annual meeting of the Academy held in Columbus, Ohio, April 30, 1943.

the appeal to religion strives to fulfill is the yearning for security, a yearning which grips all of us. We tremble before the overpowering uncertainties of enveloping fate, the unknowable, and strive to achieve a harmonious relationship through religious experience. The woods, which apparently neither the scientific nor the religious experiences of my colleague had revealed to him, were that just as the all compelling quest manifested through religion is the quest for security so the all embracing fruit of science is to afford security; the security that frees from the bonds of uncertainty and superstition and soothes the troubled soul with the peace that passeth understanding.

This doctrine of security, the teaching that we live in an environment ordered by dependable, understandable principles is as old as science itself, the *leit motif* that has threaded its guiding way through scientific thought throughout the ages from the times of the early Ionian teachers to the present. As F. H. Pike[2] reminds us in a published note within the year, "One great change which occurred in the period from Thales to Plato was the substitution of a world, perhaps even a universe, of law for the older world of caprice." And with it there was born a new thing, "science," which as Burnet[3] so aptly defines in his survey of Greek philosophy is "thinking about the world in the Greek way."

To return to my colleague and, I fear, to many others like him, what a woeful void there must have been in what he reaped from science, perhaps also in the guidance offered him by his mentors. One is moved to paraphrase the biblical interrogation, what doth it profit a man to gather the facts of science and lose its soul?

One group of scientific facts, its bare, gaunt trees stripped of their pleasing foliage, tells us that every particle of matter is attracted by every other particle in proportion to the product of the masses and inversely as the square of the intervening distances. These few words represent a vast number of subsidiary facts and a prodigious amount of painstaking effort in their formulation. It is known to all who mull them over that they explain the floating of a mote of dust to the ground and in the same breath the grand movement of the planets through space. I am wondering, however, how many of those who have burnt the midnight oil in mastering these facts, how many of our students, indeed perhaps, how many of their instructors and how many of our friends in the humanities like my colleague of the religious discussion have been taken to a mountain top from which they have been able to see that these same facts have served also as a guide post in our quest of the ultimate, in moulding man's interpretation of his universe, in orienting himself in time and space; that they have been one of the things which has helped to satisfy man's wonder, the awsome wonder that comes over one as he gazes into the depths of a star-studded winter sky where wonder leads to wonder and one is moved to breathe the thought, "What is man that thou art mindful of him?"

As Sir James Jeans[4] points out, "The law of gravity was important not so much because it told us why an apple fell to the ground or why the earth and planets moved around the sun as because it suggested the whole of Nature was governed by hard and fast laws—in the light of Newton's work—Man began to see that he was free to work out his own destiny without fear of disturbance from interfering gods, spirits, or demons." Or again to partly paraphrase Dampier,[5] Newton's reduction of the phenomenon of gravity to mathematical terms, coupled with the work of Copernicus and Galileo, in one grand sweep validated terrestrial mechanics in celestial spaces and eliminated with finality the Aristotelian and

[2]Science, April 24, 1942.
[3]Early Greek Philosophy, 4th Edition, 1930.
[4]"Scientific Progress."
[5]Sir William Dampier, "A History of Science," 1938.

mediaeval doctrine that "the heavenly bodies are divine, incorruptible and different in kind from our imperfect world." The effect was even deeper and struck at the very roots of religious beliefs in that it was made "impossible any longer to gaze into heaven just above the sky, and to shudder at the rumblings of hell beneath the ground." Consequently, as Brett[6] comments, "The seat of religious belief was thus moved from the heart to the head; mysticism was excommunicated by mathematics, . . . the way was opened for a liberal Christianity which might ultimately supersede traditional beliefs."

Incidentally a statement like that is indeed comforting to a zoologist. It lifts from his shoulders some of the burden placed there by the populace for having undermined ancestral beliefs.

Biology's central contribution to human thought has been the doctrine of organic evolution. This doctrine has brought coherence and order and significance to a multitude of otherwise apparently disconnected facts and theories within the field of biology itself and has opened up wide vistas of vision in other fields as well. It is undoubtedly superfluous to mention this to a scientific assemblage such as this, but there are scientists, even biologists, who tend to belittle the importance of evolution in the scheme of instruction. And here again I am moved to wonder whether we see the woods as we look at the trees; whether we consider the fact of the evolutionary origin of animals and plants as an end in itself and the meticulous details of evidence as ends in themselves or whether we look upon them as means to a broader end. As ends in themselves they are probably pleasant bedtime stories, if you like that kind of story. They are facts and add to one's store of such things, if your hobby is making a collection. If that is the spirit in which one presents the matter embellished for good measure with much precise detail, I fear that in the words of the philosopher, Irwin Edman, once applied to some of the humanities, it will be shortly "dying of anemia, of archeological hardening of the arteries and will become a corpse handled conscientiously by solemn morticians."

As means to an end the formulation of the doctrine of organic evolution, like the formulation of the principles of gravity, has served as the factual basis for a reorientation of human conceptions. If Newton paved the way for a liberalized Christianity, Darwin has paved the way for a liberalized socio-political outlook. The doctrine of organic evolution has once and for all destroyed the concept of the immutability of human institutions as well as of animal bodies. It has destroyed finality. If man as an animal is the product of change, his institution, the state, as a socio-political organization is not immutable. What served the purposes of our fathers may not of necessity serve ours. And so also have we been conditioned to discard the concept of absolutism in the field of economics. With changing times come changing economic principles.

Organic evolution with its handmaiden, natural selection, has destroyed the sociological equalitarianism of the French revolution. All men may be equal before the law; they are not equal before the bar of life. Gone too is the categorical dictum as a basis for morality and in its place has come racial experience, those standards which have survival value for the race. Morality in this light comes to mean allegiance to that code which will enable one's countrymen to live and to have life more abundantly. For those who may mourn the passing of the categorical standard, let me say that racial survival is a far more exacting standard than one which, perchance, permits of compensation by doing penance. The youthful monkey merrily swinging from limb to limb who misjudges his mark gets no second chance and leaves no descendants. It is, indeed, easier for a camel to pass through the Needle's Eye than to cheat the laws of life.

[6]G. S. Brett, "Sir Isaac Newton," 1929.

There is tonight no time, even if this could be considered an appropriate place, in which to trace all the ramifications of our racial experience as a standard by which we may order our lives. However, I should like to enlarge upon one phase of our experience which does appear to be peculiarly applicable to the present state of world affairs. Julian Huxley,[7] in discussing man's achievements points out, as have others, that "the next step of greater control must be over man himself . . . through (among other methods) doing away with nationalistic drives and superimposing an international form of government on the world." To a biologist there straightway comes the question, what evidence have we that cooperation is any more successful than isolation as a biological method? Has not the arch isolationist, Amoeba, survived for millions of years and have not thousands of other rugged individualists been successful among the animal hordes? That interrogation immediately poses another—what is success? And to answer one must differentiate between survival and mastery. An animal, all of us, may survive through a variety of devious subterfuges and expedients, the common mark of which is that they entail subservience. However, success in fullest measure is mastery over conditions. If organic evolution has any significance it is the story of how living material has through the cooperative actions of its subdivided units approached, if it has not yet attained, mastery.

I am fully aware of the fact that organic evolution does not of necessity proceed along a straight line principle, that life has followed a thousand and one devious pathways and on occasion has even retrogressed; but the fact remains, nevertheless, that at each level on which there has been a closer approach to mastery that approach has been accompanied by a greater division of labor and a closer coordination of the constituent units until in man the master, they have become woven into an intricate pattern of cooperating parts. At the opposite extreme lies an ineffectual, single-celled droplet of living material exemplified by Amoeba. Organic evolution is thus history, as much a part of our history as is the history of the written word, and as such, in fulfilling one of its functions, it points out the road we have trod and lights the way that lies ahead.

I am a zoologist, but for a moment I should like to turn historian, that man who has been termed by Schlegel a prophet looking backward, and as such a prophet refresh your memories by briefly tracing the steps of this story as others have done before me.

It can begin with Amoeba, a creature which epitomizes individualism. Not even in the commonly shared function of reproduction is it dependent upon another for assistance. A thousand and one changes have been rung on this isolationist-individualist theme among its fellow protozoans, each change having brought survival but no shred of mastery.

One of the early mutations leading out of the protozoan doldrums was that which resulted in causing proliferating cells to remain clustered together, and as such clusters to cooperate in the form of tubular units; a condition exemplified in varying degrees by the Porifera and the Coelenterata. The rewards were those that come from numbers and elementary divisions of function. This condition was followed by an innovation which resulted in dense, compact and solid masses of cells being able to exist as a single unit exemplified by our friends and tormentors, the flatworms. This state of affairs was accompanied by greater diversification in the constituent units and preeminently by rectilinear locomotion.

The next steps—three of them—in this mutating series were particularly significant; the development of distance receptors, the device which produced essentially compound animals, and the accompanying delegation of authority to subcenters which thus made possible the rapid and efficient control so characteristic of the metameric groups.

[7] "Man Stands Alone," 1940.

Metamerism is as far as life has gone in the way of physically compounding units. The compounding has continued but on the psychological level, or social level if you wish. If we are to consider psychological reactions as a specialized manifestation of physiological states, the continued compounding which we term our social organization is fully as much a physiological process as were the physical unions just outlined and as such must be considered a direct continuation of this compounding tendency, a continuation made possible by the development of distance receptors.

In saying this, I am mindful of those who maintain that social organization is not comparable to corporate organization. I am inclined to think the difference is not so much a matter of principle as of means. In the one case the constituent units have been held together by bonds of physical contact, in the other they have been as firmly held by the influence of distance receptors. Emerson,[8] the ecologist, has recently expressed the view that, "Regardless of how one interprets the unity of the more complex human societies, the human family, and other family systems, are real cooperative, supra-organismic entities. . . . Society is merely a manifestation of fundamental life attributes which are shared with other biological systems (e.g., multicellular organisms) and the division between the social and the non-social is not sharp." Jennings[9] goes further and points out that there is much to be said in favor of the conclusion that "mankind is a single great organism temporarily divided into pieces—the individuals." Through this device the essential benefits of physical union are retained and become enriched by the advantages to be derived from mobile units. The study of organic evolution is, indeed, from one standpoint essentially a study in populations. Much can be said in support of the conclusion emerging from such a study, that in its animal phases at least unitary masses of protoplasm, whether these units be cells or bodies, under similar conditions follow essentially similar principles of group organization.

The social organization of the corporate population has, as you know, followed along two lines, the one illustrated by certain insects, the other by man. Among insects the culmination is reached by the ants and the termites, those individually defenseless creatures and toothsome morsels for many a foe which have through cooperation lived from the tropics to the borders of the Arctic.

Our own social structure is an even more intricate and widespread culmination of increasingly interdependent component units the progress of which has followed one unswerving path marked by the milestones of free cells, tissues, organs, organ systems, compound organisms, then families, tribes, kingdoms, empires, major alliances, and still it holds its course into the future. Faintly outlined as yet but apparently on our course lies some type of world union. This last prophecy may be branded an ultra-utopian fancy, but it must not be thought that the pyramiding of units I have just traced whether in the field of physical union or socio-political associations came without a struggle, without false starts that led up blind alleys or, indeed, ended in stark failure.

For those who may be faint-hearted, the fact to be kept in mind is that with all the difficulties that beset the way, union was eventually accomplished, that with each union, with each sacrifice of self, with each restriction of liberty, there has been a stride toward greater mastery, toward a fuller, more abundant life for the whole. At one extreme is individualism, represented by Amoeba, beholden by neither jot nor tittle to anyone, grovelling withal in the slime and swept hither and yon by every whim of nature. At the other extreme are millions of interdependent cells united in the form of men who, in turn, through their combined efforts have overcome the sufferings of famine, the scourge of pestilence, the barriers of distance, the mysteries of the air, yes, even the intricacies of creative

[8]A. E. Emerson, Denison University Bulletin, December, 1941.
[9]Journal of Social Philosophy, January, 1937.

synthesis. Optimism for the future is well expressed in the words of the palaeontologist, Lull,[10] who writes, "The great heart of nature beats, its throbbing stimulates the pulse of life, and not until that heart is stilled forever will the rhythmic tide of progress cease to flow."

Among the social insects the price paid to the group for the benefits of cooperative action is that the individual be born to a class and have stamped upon him unalterably the form of his station in life—worker, soldier, king or queen—there to remain toiling dutifully without will or choice that the group may survive. That is straight-jacketed, inflexible efficiency, not inviting to those of us outside the pale of Nazi or Fascist rule. It has, moreover, fallen short of control, probably because its morphological inflexibility is paralleled by inflexibility of nervous reaction.

There is no gainsaying that one of the most patent of biological principles requires that when individual and species conflict, it is the individual that must give way even to the extreme of life itself. For us the demands of society are indeed becoming more and more exacting; we are individually being held to a closer and closer accounting. There is ever-increasing regimentation. But we of the vertebrate line are fortunate in that we belong to a type of social organization which permits its members the opportunity of realizing their responsibility to the group and of doing their duty voluntarily and without compulsion. If we but will, therein lies our avenue of escape from the fate of an enforced regimentation analogous to that of the insects.

The responsibility which rests upon us individually arises from the division of labor inherent in society. Each sequence in the evolutionary progress of living material from microscopic unit to dominating mass involved more and more detailed division of labor and with each advance there came increasing responsibility. For instance, in an unspecialized body like that of a sponge the entire body, as you well know, can be taken apart cell by cell and then the whole mass or any portion of it can again take on the form and function of a sponge. Here, it matters little whether any one or a group of cells fail. At the opposite extreme in man, the loss of an islet of cells in the pancreas means death. Clearly specialization and responsibility go hand in hand.

The inexorable demands of nature that each do his duty to his kind need not of necessity mean that before us lies a future in which we shall be slaves to the State, Nazi-fashion. A slave performs his duty without choice, has no voice in his fate. Before us lies the opportunity to both exercise our choice and discharge our duty. If, however, we do not so choose, we shall have responsibility and no freedom, no chance to direct our fate. There are even now those among us who would impose the prototype of insect rigidity upon our form of social organization. Its most extreme exponents are the followers of Nazi philosophy. Rauschning[11] reports Hitler as declaring, "There will be a master class . . . also a new middle class . . . and the great mass of the eternally disfranchized. Beneath them still will be . . . the modern slave class. . . . Universal education is the most corroding and disintegrating poison that liberalism has ever invented for its own destruction." Carrel[12] has expressed somewhat similar views as for instance, . . . "The democratic principle has contributed to the collapse of civilization in opposing the development of an elite. . . . modern civilization is incapable of producing people endowed with imagination, intelligence and courage. . . . the equality of their (man's) rights is unequal."

It is true that there are biological differences among us which cause difficulties in a democratic state, but gene distribution is such that few are wholly of inferior

[10]R. S. Lull, "Organic Evolution," 1929.
[11]"The Voice of Destruction."
[12]"Man, the Unknown."

quality and few, if any, of wholly superior stuff. The mechanism of transmission and interaction of genes further complicates the picture. And who is to differentiate what is good or how? As Jennings suggests, "One of the greatest difficulties in the way of effective human action lies in the lack of agreement as to the end to be attained. . . . perhaps the greatest difficulty of all lies in the lack of agreement as to the individuals or groups that should benefit by the action to be taken."

The course upon which the physically undifferentiated and mobile fabric of the vertebrate social organization is set does not of necessity demand a society straight-laced and closely regimented in which freedom of action is surrendered. It does demand and will exact the surrender of action for self alone. It does place upon us unalterably responsibility to our fellow men. The failure on the part of many of us, most of us I fear, to realize this fact has been an important source of our present unrest. With a sense of allegiance to the group in the spirit of that larger self-interest which realizes that the greatest good for the individual is inextricably bound up with the good of the group, there need be no fear of enforced regimentation. Unlike the straight-jacketed insect civilization, such realization of individual responsibility permits us freedom to pass from stratum to stratum as the cast of the genes may decide and leaves us the stimulus of individual initiative. The specializations of society without a sense of responsibility lead to the limited privilege of an unbridled, cancerous growth; specialization with a sense of the common good leads to the harmony of a well-ordered body.

As I come to the end of my remarks let me mention once again my thoughts at the close of the academic year, my interest in the trees of fact and the woods of significance. I have, as you see, directed your attention to but a few examples. First among them was the very soul of science, the sense of security which scientific facts convey. Second was the influence of what may appear to be purely physical principles upon the liberation of man from the bonds of religious ignorance; third, the significance of the facts of evolution as a guiding light upon our way and finally the significance of the individual's obligation to the group. I have discussed them because with all the immediately practical applications of fact that can be made, which are truly many and important, such applications alone are not sufficient. The instructor in science has not completely fulfilled his responsibility to those who come to him for guidance unless he has pointed out the wider significances. These broader applications which carry us into the realm of ideas are required to fully satisfy that age-long quest which Sir William Dampier has so richly clothed in these words:

"At first men try with magic charm
To fertilize the earth,
To keep their flocks and herds from harm
And bring new young to birth.

Then to capricious gods they turn
To save from fire or flood;
Their smoking sacrifices burn
On altars red with blood.

Next bold philosopher and sage
A settled plan decree,
And prove by thought or sacred page
What Nature ought to be.

But Nature smiles—a Sphinx-like smile—
Watching their little day
She waits in patience for a while—
Their plans dissolve away.

Then come those humbler men of heart
With no completed scheme,
Content to play a modest part,
To test, observe, and dream.

Till out of chaos come in sight
Clear fragments of a Whole;
Man, learning Nature's ways aright,
Obeying, can control."

THE ANTS OF THE KILDEER PLAIN AREA OF OHIO

(Hymenoptera, Formicidae)[1]

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This paper consists of a description of the Kildeer Plain, a list of the varieties of ants found, and some notes in regard to their habits of nesting as observed in this area.

Wherever variations in the geological conditions of a region occur, there are found corresponding differences both in the flora and fauna. The climatic conditions including temperature, precipitation, etc., may be quite similar, yet there appear an amazing number of different habitats for living organisms. The very fact that one type of soil is composed of clay while another is composed chiefly of sand or the fact that here may be good drainage while at some distant point may be none at all, certainly determines in no small measure the type of organism which will exist or fail to find desirable environment.

This is true on a large scale across the entire width of the continent, on a smaller scale in the separate states and still more minutely, within the counties themselves.

The species of ants found in the Kildeer Plain Area of Ohio are of particular interest to the myrmecologist, for here is a small area which geologically is unusual in the state.

The following list embracing twenty-seven species, subspecies and varieties is undoubtedly incomplete. Ants have been taken from as many varied habitats as a small plain area presents. They have been taken in a dense oak-hickory forest at the edge of the prairie, on sloping banks of the Tymochtee Creek, along roadsides, in open prairie fields, many of which have not been under cultivation for five or six decades, and open fields that are again being put under cultivation. In the last mentioned instance, the newly plowed furrows were carefully examined for species which otherwise might have been overlooked.

The collections were made chiefly during the summer months of 1938 and the spring of 1939.

Due to the fact that there is no extreme environmental difference within this area, comparatively few species are found, but some of these appear in great abundance, for example: *Formica cinerea neocinerea*, which is known as a prairie ant. Some species living here are not very common elsewhere in the state, and some species commonly found elsewhere are prevented from living in this area abundantly because of the limiting characteristics of the region.

DESCRIPTION OF LOCALITY

The Kildeer Plain area is located mostly in the south central portion of Wyandot County between Tymochtee Creek on the west and the village of Harpster. It extends also into a small section of northwestern Marion County. The area is approximately nine miles in length (east and west) and six miles in width (north and south). Its entire western and most of its southern boundary is determined chiefly by Tymochtee Creek.

[1]The writer expresses sincere appreciation to Dr. C. H. Kennedy, under whose guidance and stimulation the work has been done, and to Dr. Mary Talbot who has given so freely of her time, particularly in the checking of identifications. Gratitude is extended also to Dr. Earl L. Core for identifications of the flora of the region and to Dr. J. Ernest Carman who has given valuable assistance in the comprehension of the geology of this plain area.

This plain is one of several found in the state. It is high in comparison with the altitudes of Ohio, its average elevation being almost nine hundred feet, with a general slope toward the north. It is situated in the Ohio-Erie Divide or the Wabash Terminal Moraine Region, and, being in the midst of this great water shed of the state and slightly on the northern slope, there are no large streams. The chief drainage, of which there is little, is the Tymochtee Creek and its tributaries. Just a little farther to the north are the headwaters of the Sandusky River. The general course of both of these streams is due north, toward Lake Erie.

The soils of this area are composed chiefly of three types: Miami silt, Clyde loam and clay loam. H. W. Olson, in studying the soils of this county as a habitat for earthworms, finds the organic content of the soil to vary from 3.5 per cent to 5 per cent, which is considered a high content. The pH of the soils ranges from 7.40 to 8.40, and the moisture content is found to vary, during normal conditions, from 15 per cent to 32 per cent. One conclusion can be drawn immediately from these observations, i. e., that variations in the flora and fauna are not restricted by the lack of organic material in the soil. It is also to be noted that there is considerable change in the moisture content from time to time.

Since the soil in this restricted area is chiefly of a fine texture, it is generally present in one or the other of two extreme conditions: either too wet or too dry. These conditions are not conducive to the healthy growth of flora, particularly of trees. Miss Thompson[2] states, "The affinities of the flora of any region are the product of past geologic and climatic history and of present edaphic and climatic conditions." Fauna, and particularly the type in which we are here interested, is certainly restricted by the lack of certain plants and again encouraged by the presence of others which may be found on the prairie.

The climate for this small area is apparently no great limiting factor in determining the presence of the ants found here, because the climate is consistent with that throughout the state. The mean annual temperature for Ohio ranges from 49° F. in the north to 53.5° F. in the south. Rainfall is abundant over all the state, increasing only slightly in the north.

The ant population of this section is determined both directly and indirectly by past geologic conditions: directly, by the type of soil itself, and the poor drainage; indirectly, by the growth of flora and fauna which is here due to these conditions.

Prairies are chiefly of two distinct types: high and low. The low prairie has been formed from a depression in the moraine region. At various times of the year it is covered with water. The high prairie was formed from depressions or small lakes which have been filled in. It is moist, but above water.

It is generally accepted that the Kildeer Plain is one of the latter type. With the slope of the plain slightly to the north and the recession of the terminal moraine, there apparently was not enough drainage to carry away all the moisture. As the moraine receded farther, the moisture was allowed to drain off and the shallow lake bottom became filled by the slow accumulation of vegetable matter, and perhaps by the washing in of adjacent land and fine soil.

The flora of this plain area will be discussed briefly for two reasons: (1) because it has a direct bearing upon the fauna, and (2) because it, too, is of a different nature than that found over most of the state.

As far back as 1835 the peculiarities of the plant and animal life were noted by Cyrus P. Bradly in his journey from Marion to Sandusky, for he writes, "I shall never forget my ride across the gloomy, unhealthy prairies which produce nothing but long grass, horned cattle, disease, mosquitoes and rattlesnakes. One species

[2]Thompson, Isabel. 1939. Geographical Affinities of the Flora of Ohio. The American Midland Naturalist. Vol. 21, No. 3, May, page 730.

of meadow grass was shown to me which is given the singular cognomen of Roman Catholic Grass." (*Hierochloë odorata* (L.) Beauv.).[3]

There is much evidence to prove that in earlier times prairies were more numerous and continuous than they now are. This gave opportunity for prairie species to spread, and it seems quite probable that some of the plants found on this prairie now have spread in from the west. Some of the species of plant life here are found only on isolated prairie patches such as are represented by the Kildeer Plain.

The oak-hickory forest on the edge of the plain is typical except that the area is extremely humid. Parts of the forest floor are entirely covered by jewel weed (*Impatiens biflora* Walt.)[4] At the edge of the forest the following plants are in evidence: water plantain (*Alisma plantago-aquatica* L.), button-bush (*Cephalanthus occidentalis* L.), wild yellow lily (*Lillium canadense* L.) and sensitive-fern (*Onoclea sensibilis* L.).

Scattered here and there throughout the plain area is the cotton wood tree (*Populus deltoides* Marsh). This tree is found typically, bordering streams and moist places, and here too, it finds favorable conditions for growth.

A few of the remaining typical plants in the Kildeer Plain are:

Hairy Milkweed.....(*Asclepias pulchra* Ehrh.)
Sulivant's Milkweed.....(*Asclepias sulivantii* Engelm.)
Sallow Sedge.....(*Carex lurida* Wahl.)
Spear Thistle.....(*Cirsium lanceolatum* (L.) Hill)
Squirrel-tail Barley.....(*Hordeum jubatum* L.)
Slender Rush.....(*Juncus tenius* Willd.)
Wing-angled Loosestrife.....(*Lythrum alatum* Pursh.)
Flat-stemmed Blue Grass.....(*Poa compressa* L.)
Virginia Rose.....(*Rosa virginiana* Mill.)
Dark green Bulrush.....(*Scirpus atrovirens* Muhl.)
Fringed Yellow Loosestrife.....(*Steironema ciliatum* (L.) Raf.)
Western Ironweed.....(*Vernonia fasciculata* Michx.)

Western Ironweed is recorded for Ohio only in two counties: Erie, which borders Lake Erie, and Wyandot, the county in which Kildeer Plain is located. Sulivant's Milkweed is an illustration of plant life which occurs in isolated prairie patches.

All of the plants here recorded are typical of one of the following situations, each of which is closely allied to the other: roadside, meadow, moist meadow, prairie, swamp margin, swamp and wet woods. Such are the conditions found in Kildeer Plain.

HYMENOPTERA—FORMICIDAE

Subfamily Ponerinae

This group is listed first because it represents the most primitive of all the *Formicidae*, and it may well be that the Ponerines represent the ancestral stock of the more highly specialized subfamilies. Its species are found in greater abundance in the tropic than in the temperate zone. Some species of *Ponerinae* are found quite frequently, but even then, their nesting sites are much more inaccessible than those of other species.

The colonies are small and the nests are always found in well-protected, damp places such as decaying wood and damp soil which may be found under rocks and boards.

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[3]Sears, P. B. 1926. The natural vegetation of Ohio. Ohio Jour. Sci., 26, page 137.

[4]Identification of the flora of the region by Dr. Earl L. Core of West Virginia University, Morgantown, West Virginia.

The subfamily *Ponerinae* is easily recognized by the presence of a distinct constriction between the first and second segments of the gaster and also of a large, well developed sting.

Genus **Ponera** Latreille

Ponera coarctata subsp. **pennsylvanica** (Buckley).

Ponera pennsylvanica Buckley. 1866. Descriptions of new species of North American Formicidae. Proc. Entom. Soc. Phila., 6: 171. (Worker.)

Workers and males of this ant were taken both in the woods and in the open field. Workers were found under bark and in partially decayed oak. The males, with a few workers, were found in August in the deep hummock of a prairie field. The colonies of this slender species of ant are very small. There are seldom more than forty or fifty workers with five to fifteen pupae during brood rearing.

Subfamily Myrmicinae

This subfamily, while not as primitive as the *Ponerinae*, is also of the more primitive type.

Representatives of the various genera are found in a variety of habitats and in many sections of the country. The species vary greatly in size, color, and size of colony. Some, because of their numbers and place of abode, get to be pests, as in the case of *Monomorium pharanois* (Linnaeus).

Most members of this subfamily also have large, well developed stings as were present in the *Ponerinae*. Instead of having a well developed constriction beyond the first segment of the gaster, as in the Ponerines, this segment is clearly separated off, so that the pedicel consists of two highly specialized segments, which is the outstanding mode of identification of all *Myrmicinae*.

Genus **Crematogaster** Lund

Crematogaster lineolata (Say)

Myrmica lineolata Say. 1836. Descriptions of new species of North American Hymenoptera and observations on some already described. Bost. Jour. Nat. Hist. I: 290. (Worker, female, male.)

This rather common species is found to nest in many situations. It was found in woods, in open fields nesting in hard, dry clay and in moist soil. Winged males and females were taken in July.

The nesting sites of this ant, as found here in the prairie, provide an illustration of insect adaptation to an environment. Here in the prairie where there is not an abundance of dead wood, it must by necessity find other nesting sites, if it is to survive.

Crematogaster lineolata var. **cerasi** (Fitch).

Myrmica cerasi Fitch. 1854. Trans. New York State Agric. Soc. XIV. p. 835. (Worker.)

This variety is slightly lighter in color than the previous one, otherwise is similar. It was taken from dead elm and oak trees. A very large colony, including workers, winged males and females, was taken in August, also from a dead elm.

Genus **Solenopsis** Westwood

Solenopsis molesta (Say).

Myrmica molesta Say. 1836. Descriptions of new species of North American Hymenoptera and observations on some already described. Bost. Jour. Nat. Hist. 1: 295. (Worker.)

The thief ant, by which name this minute species is sometimes known, is found in almost any type of surroundings. It lives independently or as a thief in other formicaries. It has been found in grass, in mounds, under stones all of which may be in moist or in dry places. It has been taken in this area in association with Myrmica and Formica, particularly on the tops and sides of the mounds they build. The colonies frequently become quite large. Winged males and females were taken during July and August.

Genus **Myrmecina** Fabr.

Myrmecina graminicola subsp. **americana** var. **brevispinosis** Emery.

Myrmecina latreillei subsp. *americana* var. *brevispinosa* Emery. 1894. Zool. Jahrb., Abth. of Syst., 8: 271. (Workers, females, males.)

The one small colony which was taken was found nesting in a crevice under the bark of elm in a damp, shady woods. It prefers shady, rather moist habitats.

Genus **Leptothorax** Mayr

Leptothorax longispinosus Roger.

Leptothorax longispinosus Roger. 1863. Die neue aüfgefuhrten Gattungen und Arten meines Formiciden Verzeichnesses. Berl. Ent. Zeitschr., VII, p. 180, No. 69. (Worker.)

A small, black species which is usually found nesting in tight places. Small colonies were taken from this area in the crevices of bark on living oak in the woods. Winged females were found in August in the scaly bark of elm.

Leptothorax fortinodis Mayr.

Leptothorax fortinodis Mayr. 1886. Die Formiciden der Vereinigten Staaten von Nordamerika. Verh. Zool.-bot. Ges. Wien. XXXVI, pp. 451, 452. (Worker, female.)

At no time was an entire colony of this species taken. A few stray individuals were found on the bark of oaks at various times, and twice they were found as strays in the open field.

Leptothorax curvispinosus Mayr.

Leptothorax curvispinosus Mayr. 1866. Sitz. B.k. Akad. Wiss. Wien, 53: 508. (Worker.)

The few stray ants of this species, which were observed, were wandering on vegetation at the edge of the woods.

Leptothorax curvispinosus subsp. **ambiguus** Emery.

leptothorax curvispinosus subsp. *ambiguus* Emery. 1895. Beiträge zur Kenntniss der Nordamerikanischen Amneisenfauna. Zool. Jahrb. Abth. f. Syst., VIII, pp. 317, 320. (Worker.)

Most of these small yellow ants were found as strays in the woods and in the open field. A few were found in the mounds of *F. neocinerea*. One nest with forty-four workers and a deälate queen was taken from a hummock in a field, during August. The firm, clay hummock was completely covered over with clover.

Genus **Myrmica** Latreille

Myrmica scabrinodis lobicornis var. **fracticornis** Emery.

Myrmica scabrinodis lobicornis var. *fracticornis* Emery. 1895. Zool. Jahrb. Syst. Vol. 8, p. 313. (Worker.)

This small, dark colored ant was taken abundantly in shallow, grass covered mounds of the prairie. It was found independently in mounds and was collected several times at the base of *F. neocinerea* mounds. With but one exception, it was always found where there was moisture, and was occasionally found in very wet clay. Winged males and females appear during August and were taken abundantly. This was one variety that was found in the moist furrows of newly plowed fields. Since the varieties of *M. scabrinodis* are so similar, there is some doubt as to the identification.

Myrmica scabrinodis sabuleti var.?

(This form is recognized by Dr. Neal A. Weber in an unpublished monograph of the genus Myrmica.)

This ant is quite similar to *M. fracticornis* Emery, except for a slight variation in the frontal carina. This variation is so slight that it offers difficulties, consequently identification of this species is also uncertain. This variety, not as common as *M. fracticornis*, was collected only once. The nest, which contained winged queens, was located in a small grass-covered mound, in a field.

Genus **Aphaenogaster** Mayr

Aphaenogaster fulva subsp. **aquia** (Buckley).

Myrmica (*Monomerium*) *aquia* Buckley, S. B. 1867. Descriptions of new species of North American Formicidae. Proc. Ent. Soc. Philad. 6: 341. (Worker, female.)

A moist blue grass-clover situation provided the habitat for the few times this subspecies was found in the open field. At no time was a nest observed in the area, the few specimens having been taken as strays.

Subfamily Dolichoderinae

There are comparatively few species in this subfamily, but they have a wide range of habitat.

In this subfamily the pedicel consists of but a single segment which is not vertically protuberant, and there is no constriction between segments in the gaster. The sting is vestigial or absent.

Genus **Dolichodorus** Lund

Dolichoderus plagiatus (Mayr).

Hypoclinea plagiata Mayr. 1870. Neue Formiciden Verh. Zool.-bot. Ges. Wien. 20: 957–960. (Worker.)

This ant was taken only once, and then just a few workers were found on a smilax vine which was growing on an elm tree at the edge of the woods. It is easily distinguished by the epinotal shelf or hood and by the presence of a coarsely puntcate head and thorax and lighter spots on the abdomen.

Genus **Tapinoma** Forster

Tapinoma sessile (Say).

Formica sessilis Say. 1836. Descriptions of new species of North America Hymenoptera and observations on some already described. Bost. Jour. Nat. Hist. 1: 287–288. (Worker, female.)

A wide-spread species, it is found to nest in varied circumstances. It was taken in the open field, in woods, under stones, on the bark of trees, in sunshine and in shade. The larvae and pupae of this ant are dull orange in color, and when an entire nest is uncovered it frequently emits a peculiar odor which has often been called a "rancid butter odor."

Subfamily Componotinae

The species represented in this subfamily are more highly developed in habits than some previously mentioned. The number of species is large and each genus is highly subdivided. In this subfamily we have represented some of the largest known ants as well as one of the smallest.

The pedicel in this group consists of only one segment and the sting is either vestigial or absent.

Genus **Brachymyrmex** Mayr

Brachymyrmex heeri subsp. **depilis** Emery.

Brachymyrmex heeri Forel subsp. *depilis* Emery. 1893. Beiträge zur Kenntniss der Nordamerikanischen Ameisenfauna. Zool. Jahrb. Syst. 7: 635. (Worker, female, male.)

One of the smallest ants, it is known to nest in shady places, under stones, in cool, moist sites. Each time it was found on the prairie it was located in plowed furrows of cool, moist earth, which were at least eight inches deep. Its distribution is probably widespread here, but due to its nesting habits, it was not found frequently.

Genus **Camponotus** Mayr

Camponotus hecurleanus subsp. **pennsylvanicus** (DeGeer).

Formica pennsylvanica DeGeer. 1773. Mem. Serv. Hist. Insect., 3: 603, Pl. 31. Figs. 9–10. (Workers, females, males.)

This ant shows a wide range of adaptability to temperature and moisture. It is by far the most abundant *Camponotus* in the Middle West. Each time this species was taken in the oak-

hickory woods at the edge of the prairie, it was found in partially decayed logs and stumps. Once it was found as a stray in the open field about twenty-five feet from a poplar tree, wandering about in the grass.

Camponotus caryae (Fitch).

Formica caryae Fitch. 1855. Trans. N. York State Agri. Soc. 14: 855–859. (Worker, female, male.)

Loose bark of trees and hollow twigs formed the nests for this species. At no time were large numbers taken, because the individuals of a colony on being disturbed scatter quickly. Winged females were found in August.

Genus **Lasius** Fabricius

Lasius niger subsp. **alienus** var. **americanus** Emery.

Lasius niger (L.) subsp. *alienus* Forster var. *americana* Emery. 1893. Beiträge zur Kenntniss der Nordamerikanischen Ameisenfauna, Zool. Jahb. Abth. Syst. Vol. 7, p. 639, pl. 22. (Worker, female, male.)

This ant is the most common and most abundant of all ants and is found in nearly all parts of North America. It displays evidence of indifference in the location of its nesting sites, for it has been found in this prairie region each time collecting was done and in all types of habitat. In the woods it prefers damp logs for its nesting sites, while in the prairie proper, it nests in the soil. Winged males and females were found abundantly in August.

Lasius umbratus subsp. **mixtus** var. **aphidicola** (Walsh).

Formica aphidicola Walsh, B. D. 1862. On the genera of aphidae found in the United States. Proc. Ent. Soc. Philad. 1: 310. (Worker, male.)

The colonies of this variety cultivate root aphids and coccids. It is undoubtedly because of this characteristic that these ants were found in the moist roots of grass which was growing at the base of trees in the woods. Collections were also made from logs in the woods and from mounds located near a ditch at the edge of the woods.

Genus **Formica** Latreille

Formica fusca var. **subsericea** Say.

Formica subsericea Say, T. 1836. Bost. Jour. Nat. Hist., 1: 289. (Worker, female.)

Workers of this species were taken all through the woods in partially decayed logs, in mounds at the edge of the woods and along roadside ditches. They were encountered quite frequently, for the ant is common in the region.

Formica pallidefulva subsp. **nitidiventris** Emery.

Formica pallidefulva Latreille var. *nitidiventris* Emery. 1893. Beiträge zur Kenntniss der Nordamerikanischen Ameisenfauna. Zool. Jahrb. Abth. Syst. Vol. 7, p. 672, pl. 22. (Worker.)

Most of these ants were found in the open field, but always in places protected by stones and hummocks. They were also found on the slope of Tymochtee Creek under stones which were shaded by trees. Winged queens were taken in July.

Formica pallidefulva subsp. **nitidiventris** var. **fuscata** Emery.

Formica pallidefulva subsp. *fuscata* Emery. 1893. Beiträge zur Kenntniss der Nordamerikanischen Ameisenfauna. Zool. Jahrb. Syst. 7: 656. (Worker, female.)

Only a few workers of this variety were found in the region, and these on the bark of an oak in the dense forest. This species resembles very closely *F. nitidiventris*, except that it is slightly darker.

Formica pallidefulva Latreille subsp. **schaufussi** Mayr, var. **incerta** Emery.

Formica pallidefulva schaufussi var. *incerta* Emery. 1893. Beiträge zur Kenntniss der Nordamerikanischen Ameisenfauna. Zool. Jahrb. Syst. 7: 655–656. (Worker, female, male.)

These were found as strays in the open field and also at the edge of the woods

Formica cinerea var. **neocinerea** Wheeler.

Formica cinerea cinerea, var. *neocinerea* Wheeler. 1913. A Revision of the Ants of the Genus Formica (Linne) Mayr. Bull. Mus. Comp. Zool. Harvard, Vol. 53, p. 399, 524. (Worker, female, male.)

This variety so closely resembles *F. rutilans* and *F. montana*, that it is quite difficult to make a distinction except for slight color variations. It is often called a prairie ant, for in the natural hummocks it finds a perfect nesting place. This is the ant which is found most conspicuously in the Kildeer Plain area, and in some fields is found in almost a pure *F. cinerea neocinerea* community.

The mounds are numerous and are quite close together. They vary in size, but generally are about six or eight inches high and about twenty inches broad. The largest mound noted was at least ten inches in height and thirty-six inches in length.

The bases and sides of the mounds usually are grass-covered and the tops are nearly always barren. Some have been found where the tops of the mounds also were grass-covered. The mounds which are free of grass on top, generally have a thin layer of debris there. This debris is composed of dry twigs, fragments of grass and possibly materials brought up from the mound.

Sixty-five such mounds were opened and all but four were found in the prairie in typical *neocinerea* communities. The remaining four were found at the edge of the forest.

One very interesting thing was noted in the fact that twenty of these mounds were built at the base of thistle. The live thistle either protruded from the mound or was found at the side. That the presence of these live thistle plants is of any consequence is uncertain, but it appears far from being coincidental, since almost a third of the mounds presented this feature.

There is a possibility that the honey-dew secreted by the aphids which dwell upon this thistle (*Circium lanceolatum* L.) furnishes the motive in this association, for frequently *F. cinerea neocinerea* has been observed on the plants, which harbored aphids, in great numbers.

The necessity of mounds for this variety of ant is not positive but it seems likely that they are a refuge and protection in periods of excess moisture, since drainage is poor. The nests themselves extend into the soil to the water table, a depth of several feet. They may dwell either below the surface level or above in the mound, as necessity demands.

A greater choice of temperatures for brood rearing occurs in a mound superimposed on underground galleries. The temperature at various places within a mound is unequal, thus making it possible for the brood to be moved to warmer and cooler areas, as may be necessary.

Formica cinerea var. **rutilans** Wheeler.

Formica cinerea var. *rutilans* Wheeler. 1913. A revision of the ants of the Genus Formica (Linne) Mayr. Bull. Mus. Comp. Zool. Harvard 53: 399, 525–526. (Worker.)

This variety was located in three nesting sites: in a newly plowed field, a mound in the prairie resembling that of *F. neocinerea* and in a small mound at the edge of the woods. Due to the similarity of this ant to *F. neocinerea* in both appearance and habits, it is difficult to identify, consequently, this identification is uncertain. It was not observed abundantly in the region.

Formica montana Emery.

Formica subpolita var.? *montana* Emery. 1893. Zool. Jahrb. Syst., Vol. 7, p. 663.

This ant is extremely difficult to distinguish from *F. neocinerea* and *F. rutilans*, for both the ant and the mound resemble these two species.

The mounds which were opened were found in the same field scattered among the *F. neocinerea* mounds. These mounds were present also at the base of thistle. The habitats of these ants seem to be identical.

Formica ulkei Emery.

Formica ulkei Emery. 1895. Beiträge zur Kenntniss der Nordamerikanischen Ameisenfauna. Zool. Jahrb. Syst. 7: 663, pl. 22, fig. 7. (Worker.)

This ant belongs to the *exsectoides* group which is distinguished by having the head of the worker and the female deeply excised behind.

The mounds which this ant builds resemble greatly the mounds built by *F. neocinerea*, but they are distinguished by their general shape. The *F. ulkei* mounds are much rounded on top and as they continue to grow, they are built in height as well as in width. The *neocinerea* mounds, in contrast, have the tops flattened and grow chiefly in width.

The location of the *ulkei* mounds shows a marked difference, for this species prefers to nest at the edge of the woods or along roadsides and ditches where there is a constant supply of moisture.

DISCUSSION

1. *Formica cinerea neccinerea* is by far the outstanding ant in this Kildeer Plain area, both with reference to the size of the colonies and its widespread distribution in the region.

2. The species of ants in the area are determined in part by the topography of the region, the amount of moisture, and the materials which can be used for nesting places.

3. On the edge of the plain where slopes and wooded areas are included, the number of species increases in proportion to the materials which can be used for the nests of colonies.

4. Many of the ants commonly found in other parts of the state are not found here, or are rarely found, due to restrictions in the environment.

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DROSOPHILA CULTURE WITH A MINIMUM OF AGAR

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Since the early days of *Drosophila* culture, agar has served as an important ingredient of standard Drosophila media. At present agar stocks in many *Drosophila* laboratories are rapidly nearing depletion. Reduced laboratory personnel, the prohibitive price of agar and the prior claims on it for important bacteriological work constitute a serious problem. However, it seems patent that the Drosophila work should be continued at least to the extent of preserving valuable stock cultures which represent many years of careful work and which could in many cases not be replaced if once lost. For years the author has been particularly interested in culture methods, and therefore makes some suggestions here which he hopes may be helpful.

Stock cultures of the various *Drosophila* species are best kept in containers at least as large as quarter pint bottles and preferably in half pint bottles rather than in vials. The larger containers with larger food mass provide a margin of safety where reculturing is not done strictly on schedule. It is important to use enough adult flies in making up a fresh culture so as to eliminate chance of losing the culture through the accidental death or sterility of a few of the parent flies. As the adult flies feed on solid or semi-solid surfaces and do not burrow into media their food supply is determined by total exposed surface and not by volume of food. However, as flies easily become mired in soft food a medium with an agar base is by far the most convenient and satisfactory. Some laboratories have with some degree of success increased the corn-meal and oat-meal content of the medium and reduced or eliminated the agar content. However, such media are difficult to pour and not entirely satisfactory. For stock cultures we have reduced the agar content somewhat, but pour only a thin layer of medium about one fourth inch deep in half pint bottles. This gives the same feeding surface for adults as medium poured to a depth of an inch and a half. In this way we can pour from 125 to 150 half pint culture bottles with the use of 25 grams of agar. Then after a week or somewhat longer in case of slow breeding species a plentiful supply of food is added for the young larvae. This food contains no agar. It may consist of chunks of corn-meal, Karo, yeast mixture or more frequently we use a sheet of facial tissue dipped in a fresh suspension of baker's yeast in water, about 100 grams of yeast to 600 cc. of water. Thus on a minimum of agar adult flies are provided adequate surface for feeding and later larvae are supplied adequate volume of food. With this procedure there is no difficulty encountered in reculturing as the food mass has formed a cake which does not easily shake loose by the time a new generation emerges.

For experimental cultures (but not for stocks) the following method is used. Corn-meal, Karo, agar medium enriched with brewer's yeast is made up and poured into suitable containers such as large covered glass dishes or aluminum pans. As Moldex is used, dishes of this medium may be kept in the refrigerator for a week or longer. A supply of cardboard parallelograms about an inch and a half long and cut on the bias is made up. A dish of medium is turned out onto a flat tray and cut into blocks about one inch long and a quarter inch thick. Cardboard strips and blocks of medium are of a width to fit into the size of vial used. Blocks of medium are placed on the cardboard strips and a drop of heavy yeast suspension added. For convenience in handling, glass vials are held together

in sets of seven with rubber bands. These vials are set out on the table, pairs of etherized flies dropped into them and then the vials are turned on their sides, cardboard strips with medium inserted, vials plugged and placed in the horizontal position in trays, and allowed to stand for the deposition of eggs and emergence of young larvae. After several days the vials are unplugged, parent flies released, and with forceps the cardboard strips are removed. Into each vial is poured a suspension of baker's yeast in water (see above), and a sheet or part of a sheet of facial tissue folded once and pushed down to the bottom of the vial. For a large vial 100 mm. x 15 mm., one fourth full of yeast suspension, a double sheet of facial tissue will absorb the liquid. The tissue should then be pulled back slightly from the bottom of the vial to ensure the complete soaking up of the liquid medium. The cardboard strip containing medium, eggs and larvae is then dropped in on the paper and the vial replugged and set in an upright position.

The larvae burrow very readily all through the paper base, provided too much yeast suspension has not been used. Experience will indicate how much paper and yeast suspension to use for vials of different sizes. Pupation takes place mostly in the paper. By this method the yield per vial is large, the flies are of uniform size, reach maximum size for the species, and owing to the abundant and easily available food supply larval competition is cut to a minimum. There is less spread in the emergence period than with other media. However, flies should be examined within two or three days of emergence as the paper-yeast suspension is not an adequate diet for adults. A small piece of fresh solid medium added after pupation will keep the adults over if they cannot be examined soon after emergence.

For some years I have used the method described above for all experimental cultures. For such large species as *Drosophila hydei*, *D. robusta*, and *D. funebris* yields of 300 flies per vial are not uncommon, and the average yield is over 150 flies. Furthermore, vials are more easily cleaned than where agar medium has been poured into them. Even where there is an abundant agar supply the author recommends this procedure for experimental cultures. In case agar supplies are depleted, thick corn-meal or other culture media which are difficult to pour might readily be cut into blocks for use as described above.

Floriculture

This book is described by its authors as ". . . a text for the teaching of a course dealing with ornamental plants." It will serve this purpose well. Approximately 140 pages are devoted to lists, keys, and tables of the characteristics, requirements, and floricultural uses of ornamental plants. The extensiveness of these lists will make the book valuable also to commercial ornamental plantsmen as a reference manual. The primary list of each kind of plant is arranged alphabetically according to taxonomic family. It is unfortunate that the authors, trained scientists, were not completely successful in avoiding the layman's unscientific practise of ascribing the capacity for human emotion to plants: on page 9, "suffer;" on pages 231, 339, and 402, "prefer;" and on page 324, "partial to." The seed is incorrectly defined as a "ripened ovary" on page 164. No other errors of definition were noted. The loose language of popular catalogues found its way into the descriptions of hardy waterlilies. Of the variety Attraction it is stated, "This is the largest hardy lily, . . ." while of *Odorata sulphurea grandiflora* it is stated, "This is the largest of all hardy lilies. . . ." All the illustrations are line drawings of only fair quality. Figure 49 does not show what the text describes for a side graft. Besides nine chapters on particular groups of plants, there are ten others including the following titles: Soils, Fertilizers, Soilless Culture, and Greenhouse Management.—*Elton F. Paddock.*

Floriculture: Fundamentals and Practices, by A. Laurie and V. H. Ries. 496 pp., with 67 illustrations. The McGraw-Hill Book Company, New York, 1942. $4.00.

RECORDS OF ANOSTRACAN PHYLLOPODS IN NORTHEASTERN OHIO

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Records of anostracan phyllopods (fairy shrimps) in Ohio and adjoining regions are not very plentiful. Chambers (1874) reported *Eubranchipus vernalis* from a temporary pool near Covington, Kentucky, a few miles from Cincinnati. Hunt (1882) listed *E. stagnalis* for the Cincinnati region. Garman (1924) described *E. neglectus* from Kentucky. Baker and Rosof (1927–1928), who studied spermatogenesis in fairy shrimps, collected their specimens of *E. vernalis* in the Columbus region.[1] Ward (1940) reported *E. vernalis* from several pools near Cincinnati during the spring of 1938. No published accounts of anostracan phyllopods are known to the writers for northeastern Ohio. For older records in the known distribution of Anostraca, consult Packard (1883), Johanson (1921, 1922) and Creaser (1930a). For recent records of these sporadic organisms in eastern North America, see Dexter and Ferguson (1943). The present paper is concerned with studies on the seasonal and geographic distribution of *Eubranchipus vernalis* (Verrill) in the northeastern section of Ohio.

Preliminary field collections were made of the anostracan phyllopods in the vicinity of Akron, Ohio, during the late winter and spring of the years 1938–40. During the winter and spring of 1941 a restudy of the Akron area was undertaken with the addition of several new stations making a total of 17 in Summit County. Of these 17, six stations contained populations of *E. vernalis*. One of these ponds is known to have contained this species in 1936, 1938–1940. Two others are known to have had *Eubranchipus vernalis* in 1940. In addition, a rather extensive survey was made of Portage County, involving the examination of 80 temporary pools and ponds. Of these 80, seven stations were found to contain *Eubranchipus vernalis*, the only species of anostracan found in the two counties. This species has been previously reported from Massachusetts, New York, Pennsylvania, New Jersey, Kentucky, Ohio, Indiana, Michigan, Illinois and Ontario. Hence, 13 ponds out of a total of 97 studied, or 13.4 per cent, were inhabited by this fairy shrimp. In all but four cases the population was rather large and more so than reported from Illinois and Ontario by Ferguson (1939). However, a single specimen only was taken from two of the pools. In both of these cases the collection was made near the end of the fairy shrimp season (April 8).

The presence of fairy shrimps in two ponds near Canton, thirty miles south of Portage County, was reported to us by Mr. Charles H. Kuehnle in 1940. Subsequent collections of *E. vernalis* were made there in the spring of 1940 and 1941. One of these ponds contained the largest population of fairy shrimp found in our studies. Other records were also reported from near Canton. These reports were investigated in 1942, and the findings will be published in a later paper. The presence of fairy shrimps near Wooster was also reported to the writers, but no specimens have been collected by them there.

E. vernalis was one of two species reported by Ferguson (1939) and Dexter and Ferguson (1943) from east central Illinois. The other species, *E. serratus*, the more abundant and widely distributed species there, which has also been reported from Missouri and Nebraska, was not found in our northeastern Ohio studies.

[1]The specimens were collected in a pond near the campus of Ohio State University. The university later bought the property and drained the pond. No other published records of *E. vernalis* are known for the vicinity of Columbus. Personal communication from Dr. R. C. Baker, Department of Anatomy, the Ohio State University.

One pool in Summit County contained specimens of *Eubranchipus vernalis* in the spring of 1940, but did not have them in 1941. It was also observed that they disappeared there early in the season of 1940, sometime before April 13. Apparently conditions were not favorable as the fairy shrimps continued for several weeks in all other pools which had them in this region, and reappeared abundantly in those pools the following year. No pool lacking fairy shrimps when examined in 1940 was found to contain them in 1941.

The geographic distribution can readily be seen by reference to figure 1. The distribution was widely spread and sporadic. In only two cases were fairy shrimps found in closely adjoining pools. In most cases pools having shrimps were surrounded by pools not having them.

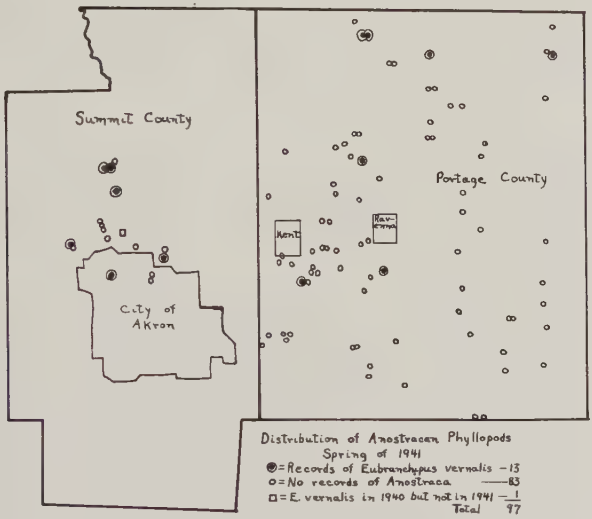

FIG. 1. Distribution of *Eubranchipus vernalis* in Portage and Summit Counties.

All specimens were collected in temporary pools or ponds of clear, cold water from winter rains and melted snow and ice. Metanauplii were collected with a plankton net, and adults with dip nets. Those pools which were frozen over during the early collections, and from which samples had to be taken through the ice, were revisited later after thawing for a more thorough sampling. Several stations containing phyllopods were visited every week until the fairy shrimp disappeared. Most of the pools were found in pastures and field corners and were of the typical "grassy" type as noted by Shelford (1913), but several were of the cattail type, and some were in ditches along roads and railroads (see figure 2 and cf. Dexter and Ferguson, 1943). Creaser (1929) found Eubranchipus most abundantly in woodland pools, and occasionally in pools which did not completely dry up. Mathias (1937) claimed that some phyllopods are found in permanent bodies of water. One of our collections came from a pond which very seldom dries up completely although a broad margin is dry each summer.

Ferguson (1935, 1939) reported *E. vernalis* in Ontario as being found only in the deeper pools. This may be due to the thick ice that sometimes forms in that region. Many of the Ohio records reported here are from shallow pools no more than one foot in depth. Two of the pools, on the other hand, were several feet deep, one having a depth of nearly five feet. Specimens were found in temper-

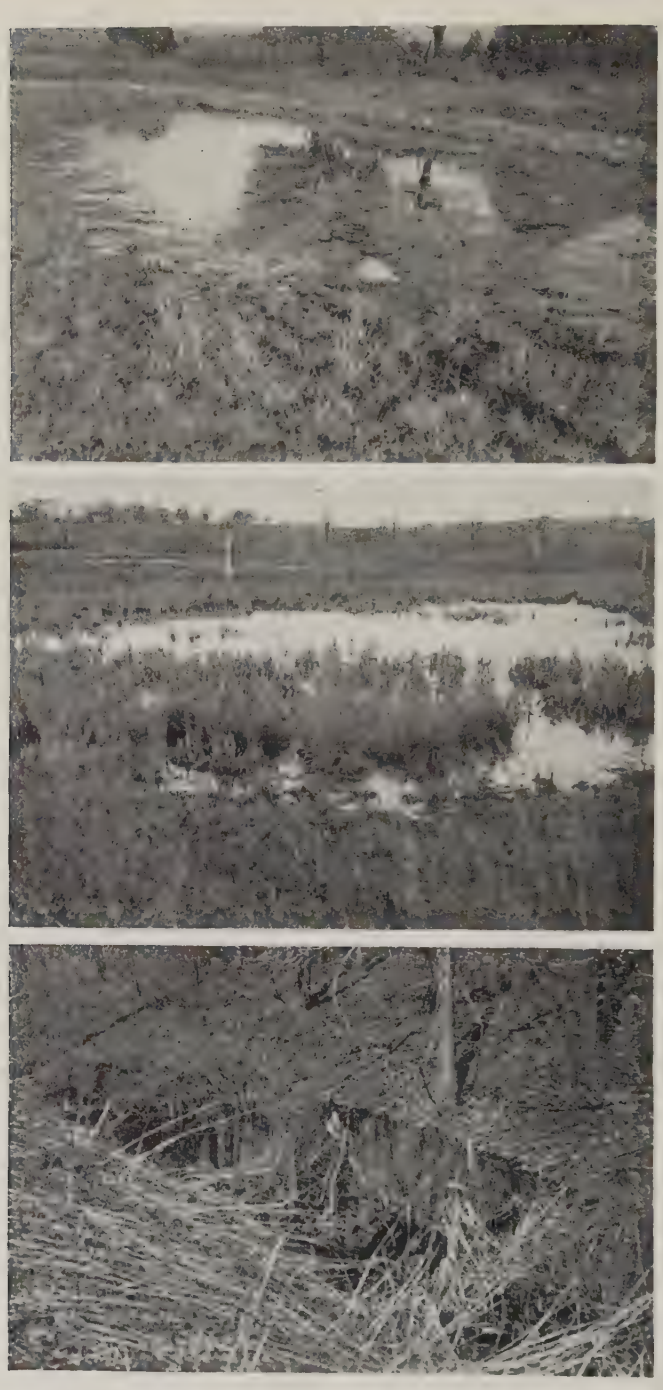

Fig. 2.
Typical grassy, cattail, and ditch type of fairy shrimp habitats.
(Photos by R. W. Dexter.)

atures ranging from 0° to 22° C. The senior author (ibid.) found *Eubranchipus serratus* in Illinois to tolerate water temperatures up to 23° C.

During night collecting it was discovered that *E. vernalis* is positively phototropic to the light of an ordinary flashlight, and that salamanders and leeches prey upon the fairy shrimps consuming large numbers. Creaser (1929) suggested that probably amphibians are important factors in controlling the numbers of fairy shrimps. Pearse (1913) and Mathias (1937) have listed the principle enemies of fairy shrimps to be tadpoles, frogs, salamanders, dytiscid, hydrophyllid, and gyrinid beetles, phryganeid caddis larvae, and water birds.

The winter of 1939–40 was cold and was followed by a late spring. The earliest record of metanauplii was taken on March 3; the earliest record of adults was taken on March 19. The latest collection was made on May 26. The winter of 1940–41 was mild, and was followed by an early spring. The earliest record of metanauplii was taken in mid-December; the first adults were collected on February 1. The latest collection was made on May 4. Several of the pools which had contained phyllopods were dried up by May 3 and 4, and all of the Portage County pools no longer contained specimens. Several of the deeper Summit County pools contained small but rapidly diminishing numbers. As in the case of the Illinois populations studied by the senior writer, a second or late brood was detected in many of the pools after the first population had reached maturity.

This study has demonstrated the same type of habitat and seasonal and geographical distribution of *E. vernalis* in northeastern Ohio as reported for *E. serratus* in east central Illinois. It shows again the sporadic nature of anostracan phyllopod distribution, the direct relation of temperature to life history and life span, and the influence of weather on seasonal occurrence.

The writers wish to thank Dr. M. S. Ferguson for a critical reading of the manuscript.

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PRE-ILLINOIAN GLACIATION IN SOUTHEASTERN OHIO

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This paper is not intended to prove pre-Illinoian glaciation in southeastern Ohio, but to present certain data that bear on the problem. These data, if taken with other known and published information, may eventually prove a greater extent of glaciation than heretofore recognized. Major purposes of the paper are to stimulate others to look for additional evidence and to encourage discussion.

Many isolated glacial erratics in northern and eastern Kentucky, beyond the Illinoian ice border, are generally recognized as evidence of pre-Illinoian glaciation. Two of the boulders are large. One at 720 feet elevation is estimated to weigh 3 tons, and the other at 925 feet elevation is estimated to have weighed 16 tons before it was blasted into fragments (1). The smaller pebbles and cobbles weighed from a few ounces up to 3 pounds (2). They probably mark the southern extension of a pre-Illinoian ice lobe, which occupied southern Ohio and northern Kentucky, the tentative boundary of which has been drawn by Jillson (2).

In southeastern Ohio erratic boulders have been described by Patton and Hicks (3). Many large cobbles several inches in diameter have been found southwest of Cambridge, Ohio, by C. H. Moses of Muskingum College at New Concord, and he continues to discover additional cobbles each year in the same area.

The writer has observed and collected rounded and subangular cobbles and pebbles of local rock and a few foreign cobbles of rotted rock at elevations from about 1000 to 1040 feet elevation. These occur in many localities within the Muskingum Valley, as: 5 miles northwest of New Philadelphia, near Winfield, 6 miles south of New Philadelphia, 10 miles east of New Philadelphia, and 10 miles north of Cambridge. The shape and composition of the rocks indicate that they have been transported, but examination of the sites excludes transportation by man. All erratics are at elevations too high to allow ice rafting as an explanation of their positions.

No pre-Illinoian glacial till has been found in Ohio. It is to be expected that erosion during the long interval of time since the retreat of the first ice sheet would remove the early till. It is quite probable that such has been accomplished, leaving scattered erratics as remnants of the till. Old till, deeply leached, with a thickness of 35 feet is found in northern Kentucky south of Cincinnati.

High-level cobbles have been found at 990 and 1020 feet elevation near Chester, W. Va., by Frank Leverett (4) and Paul Kuegle. Leverett also found gravel at an elevation of 1020 feet east of Freedom, Pa. The writer visited both locations in company with Paul Kuegle and John Chase, and found additional samples. The granite pebbles are deeply decayed. The granite cobble, about 8 inches in diameter found near Chester by Leverett and Kuegle, has a deep rind of weathering extending over an inch inward from the outside surface. The elevation, location, and deep weathering of the cobbles indicate deposition during a pre-Illinoian glaciation. Leverett (4) has described outwash deposits along the Allegheny and upper Ohio Rivers as far south as Bellaire, Ohio, as due to a pre-Illinoian ice sheet. Drainage was across the col at New Martinsville, W. Va., but the former drainage was resumed after the ice sheet retreated.

The cutting through of the major preglacial divide at Killbuck and Port Washington, and the reversal of northward drainage are results of pre-Illinoian glaciation, and prove that this early ice sheet entered northeastern Ohio. It may very probably have extended far into southeastern Ohio as well.

It is suggested, therefore, for the purposes of discussion and for stimulation of a renewed search for evidence, that a pre-Illinoian ice front extended from eastern Kentucky in a northerly direction across eastern Ohio. This boundary would then unite with the boundary of pre-Illinoian ice along the Allegheny River between Franklin and Warren in western Pennsylvania, as described by Leverett (4).

Leverett gives the age of the pre-Illinoian till in western Pennsylvania as equivalent to the Jerseyan till of the eastern United States, which is generally correlated with the Nebraskan of the central United States. The pre-Illinoian ice sheet of Ohio was probably Nebraskan.

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AN OBSERVED INFESTATION AND TREATMENT OF PSOROPTES CUNICULI IN THE EARS OF LABORATORY RABBITS

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From time to time laboratory rabbits have been observed to carry a parasitic infestation which produces a scabbing of the skin of the inner, proximal surface of the ear (Schwartz, 1928).[1]

An infested rabbit, which was being immunized against *Salmonella pullorum*, called particular attention to its condition because of the symptoms produced. The animal exhibited convulsions and loss of equilibrium. It held its head on one side, with the more heavily infested ear down.

Further investigation led to the recovery of a mite, which was tentatively identified as *Psoroptes cuniculi*. The parasite was present in large numbers in the heavily scabbed material in the outer ear, and to a lesser degree from the inner ear and semi-circular canals. The brain, which was recovered from this animal, is being prepared for further study although no microscopic lesions were noticed.

Treatment of the infestation before the inner ear is involved is very simple, consisting of swabbing the affected area with equal parts of 5% phenol and glycerol. The glycerol tends to soften the scabs so that they can be easily removed, and the phenol penetrates far enough to kill any mites left on the skin. In the majority of cases, two or three applications over a period of as many days have been efficacious in removing the mites.

[1]Schwartz, 1928, U. S. Department of Agriculture, Farmer's Bulletin No. 1568.

AN INVESTIGATION OF THE LINKAGE RELATIONSHIPS OF THE BLOOD GROUPS AND TYPES WITH HAND PATTERNS AND HANDEDNESS

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The blood groups and the M and N agglutinogen reactions are unique among known human traits, in that their modes of inheritance are simple and clear, they remain constant throughout the life of the individual, and all the genes involved are comparatively common in most populations. Such traits are ideal for linkage studies and they have probably been used for this purpose more frequently than any other human traits. (Finney, 3,4,5), (Penrose, 6,7), (Snyder, 10,11), (Weiner, 12).

Dermatoglyphics are similar to the blood reactions in that they remain constant throughout the life of the individual, that they have a genetic basis, and that the majority of the genes involved appear to be comparatively common in most populations. They differ from the blood reactions in that the number of genes involved and their reactions are not known, and that their expression is modified to a certain extent by circumstances in utero. All known dermatoglyphic features show some degree of intra-pair variation in identical twins, although these differences are much less frequent than those encountered within fraternal twins and sibs. (Rife, 8).

Functional handedness is, of course, a much more subjective trait than either the blood reactions or dermatoglyphics. Presumptive evidence of autosomal linkage between handedness and palm pattern D in the fourth interdigital area has been found, (Rife, 8), and would seem to definitely indicate a genetic basis for handedness although the mode of its inheritance is not fully understood.

The investigation reported here is concerned with tests for linkage of each of the blood reactions with handedness and hand patterns. The data were obtained from sibships within ten families of various sizes. Only unimanual handedness was considered, and classification was determined from the individual's testimony and by the performance of several operations, including throwing, sewing and driving a nail. Individuals performing one or more of these acts with the left hand were classed as left-handed, only those performing all one-handed operations with the right hand being classed as right-handers.

Five dermatoglyphic features are included in the tests. Figures 1, 2, and 3 show the appearance of each of the areas concerned. Palm patterns may be whorls, loops or vestigials. An area is considered patternless when all of the ridges run through to the margin of the palm (see Figs. 1 and 2). If Line C recurves to the margin of the palm between the triradii at the bases of the ring and little fingers, a loop is formed on the fourth interdigital area, if it recurves in the other direction, emerging between the triradii of the middle and ring fingers, a loop is formed on the third interdigital area. Main Line C is sometimes absent or abortive in one or both hands of an individual which accounts for the lower number of pairs recorded for Line C in Tables I and II. Whorls on finger-tips always have two triradii, loops one and arches none. As arches are comparatively infrequent, individuals are classed as to the number of whorls present, which varies from zero to ten.

Individuals are classed in three groups in respect to Line C, those forming patterns on the fourth-interdigitals of both hands, the third interdigitals of both hands, and the fourth interdigital on one hand and the third interdigital of the other. For the hypothenar, thenar and fourth interdigital Pattern D, individuals

are classed as to presence or absence. Those having patterns on either or both are placed in the same category, as presence.

Within recent years several methods have been devised for detecting linkage in man, notably those of Weiner (12), Burks (1), Penrose (6, 7), Haldane (2), and Finney (3, 4, 5). The methods of Haldane and Finney can be applied only where we know the specific modes of inheritance of the traits concerned, and obviously are of no value in testing dermatoglyphics and handedness.

FIG. 1. Print of left palm. H indicates hypothenar area, T—thenar area, II—second interdigital area, III—third interdigital area, IV—fourth interdigital area, C—main line C. This palm shows a vestigial thenar pattern, a loop in the third interdigital area formed by main line C, and an accessory triradius in the fourth interdigital area, resulting in a D pattern. No patterns are present in the hypothenear and second interdigital areas.

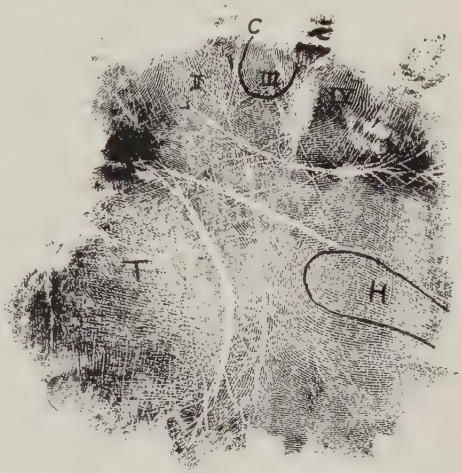

FIG. 2. Print of a right palm. No patterns are present on the thenar, second and fourth interdigital areas. Main line C forms a loop in the third interdigital area, and an ulnar loop is present on the hypothenar area.

FIGURE 3. Types of finger patterns. a—arch, b—loop, c—whorl. Arches are characterized by the absence of triradii, loops have one, and whorls three. Both whorls and loops occur on palm pattern areas, loops being the most abundant pattern type in both fingers and palms.

Our tests are based upon the paired sib technique of Burks and Penrose, in which pairs are grouped into four classes: those alike in both traits, those alike in the first and unlike in the second, those alike in the second and unlike in the

first, and those unlike in both traits. These are arranged in a 2 x 2 table, those alike in both and unlike in both forming one diagonal, and the two groups alike on one and unlike in the other trait forming the other diagonal. A modification was necessary in testing for linkage between whorls and the blood reaction, as whorls are quantitative. Pairs alike in blood reaction (Column 1, Table I) are classed as to number of intra-pair difference in whorls, (Column 2), as are pairs unlike in blood reaction (Columns 3 and 4). If pairs unlike in blood reaction show significantly greater intra-pair differences in whorls than do pairs alike in blood, it may be considered presumptive evidence of linkage.

Inspection of Tables I and II reveal only one significant Chi-square value, that of whorl frequency and the blood groups. However, pattern D and the M and N types show a Chi-square value of 3.44, only slightly below a significant level.

We have consequently tested whorls versus blood groups, and pattern D versus the M and N types by means of Penrose's technique for graded characters.

TABLE I

	Alike in both traits	Alike in blood, different in other traits	Unlike in blood, alike in other traits	Unlike in both traits	Total pairs	X^2
	1	2	3	4		
Hypothenar....	95	81	45	29	250	0.59
Thenar.....	132	42	63	13	250	1.50
Line C.....	37	54	16	22	129	0.02
Pattern D.....	121	53	45	31	250	2.50
Whorls.....	167	318	76	207	768	4.75
Handedness....	107	47	67	29	250	0.01

The above table shows the numbers of each of the various combinations of sib pairs used in testing for linkage between the blood groups and the various hand patterns and handedness. Chi-square values obtained are shown in the last column. Any X^2 value below 3.841 is not considered significant. Whorls differ from the other traits in the above classification, in that Column 1 gives the total number of pairs alike in blood group, Column 2 the total intrapair differences of those alike in blood, Column 3 the total number of pairs unlike in blood group, and Column 4 the total intrapair differences of those unlike in blood.

TABLE II

	Alike in both traits	Alike in blood, unlike in other trait	Unlike in blood, alike in other trait	Unlike in both traits	Total pairs	X^2
	1	2	3	4		
Hypothenar....	97	77	47	31	252	0.44
Thenar.....	133	41	66	12	252	2.17
Line C.....	40	59	20	22	141	0.63
Pattern D.....	119	56	43	34	252	3.44
Whorls.....	165	439	80	204	888	0.07
Handedness....	108	45	67	32	252	0.24

Data used for testing linkage between M and N blood types and hand patterns and handedness. Whorls are classed as in Table II.

While there is no evidence of linkage for Line C and the blood reactions on the basis of the tests shown in Tables I and II, the fact that there are three classes of individuals in regard to Line C may raise some question as to the validity of that particular test. Thus, it was thought advisable to obtain a further check by the method for graded characters.

Table III shows no significant association for any of the traits compared. It seems justifiable on the basis of this study to conclude, therefore, that genes determining the blood reactions are probably located on different chromosomes from those determining handedness and hand patterns.

TABLE III

	ϕ	σ	$\frac{\phi}{\sigma}$
Whorls vs. Antigen A	.01	.24	0.08
Whorls vs. Antigen B	.04	.24	0.17
Pattern D vs. Antigen MN	.44	.246	1.79
Line C vs. Antigen A	.09	.27	0.30
Line C vs. Antigen B	.71	.47	1.69
Line C vs. Antigens MN	.08	.26	0.30

Values obtained in testing for linkage between the above traits by the Penrose method for graded characters. If $\frac{\phi}{\sigma}$ is less than two, the evidence for linkage is negative.

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Nicholas Copernicus, Astronomer

On May 24, 1543, Nicholas Copernicus died. To stimulate interest in the preparation of programs and meetings commemorative of the quadricentennial of his death and provocative of thought over the period in which he lived, a brochure has been published by the Kosciuszko Foundation. This period was that in which modern scientific thinking first began to assert itself. The brochure is not merely an advertising medium, however. It is entirely worthy of consideration as an addition to one's library of truly authoritative and informative books. The story of Copernicus' life, his close relatives, the derivation of his name, and the significance of the Copernican Solar System concept which is generally accepted today the world over are interestingly and concisely presented. The excellent cover design in color is by the famous Polish miniaturist, Arthur Szyk. It depicts Copernicus among his most important inventions. Separate prints of the cover design on heavy paper suitable for framing are available at $1.00 each.—*Elton F. Paddock.*

Nicholas Copernicus, by Stephen P. Mizwa, A.M., LL.D. 88 pp. with 23 illustrations and colored cover design. The Kosciuszko Foundation, New York, 1943. 75 cents paper bound, $2.50 special bound and numbered.

ADDITIONS TO THE REVISED CATALOGUE OF OHIO VASCULAR PLANTS. XI.[1]

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Today the modern herbarium is playing an increasingly important part in the war effort. Many of our former sources of imports have been restricted or completely denied to us, and many of our native products have been depleted by vast exports. The botanist, therefore, is called upon more and more to aid in the search not only for new sources of materials but, also, for material from which synthetics can be manufactured.

It is a well-known fact that Germany has made such rapid strides in the field of synthetic vitamins that an internal collapse of that country due to vitamin starvation is a remote possibility. In many instances these advances have used basic discoveries made in the United States but never utilized here. The use of synthetic vitamins, however, has not yet proved entirely satisfactory. Consequently, the search for new and better sources of these important substances gains impetus. Achievements in this field can, in numerous cases, be traced directly or indirectly to botanists who have given freely of their knowledge of plants, their distribution, and their habitat requirements.

Amply supporting the preceding statement is a report submitted by the Soviet Scientists Antifascist Committee.[2] Research by the Soviet scientists in this field has ranged from the discovery of important vitamin C sources in wild rose hips, green walnut hulls, and pine needles to the publication of illustrated pamphlets dealing with wild-growing edible plants which raiding troops and guerillas might find behind enemy lines.

America is no longer complacent in respect to the field of new materials or that of synthetics. Herbariums throughout the country are receiving thousands of requests for information and specimens from investigators in the fields of medicine, chemistry, dietetics, agriculture, and manufacturing. For obvious reasons, detailed publicity cannot be given to this research at the present time.

To a major degree, credit must be given to the professional and amateur plant collectors for making such information available. Although they have been confronted with additional travel and employment regulations during the past year, these restrictions were not entirely without compensations. Many collectors who heretofore traveled throughout the State in search of rare plants have been forced to concentrate their efforts nearer home, with the result that many of these areas have yielded a wealth of hitherto overlooked species.

The following list of plants represents a majority of the new county and state records which have been added to the State Herbarium during the past year.

5. *Botrychium obliquum* Muhl. Oblique Grape-fern. New Franklin, Stark Co. Don M. Brown.

27.1. *Asplenium bradleyi* D. C. Eaton. Bradley's Spleenwort. Jacob's Ladder, Fairfield Co. Clyde H. Jones.

61. *Equisetum arvense* L. Field Horsetail. Thorn Twp., Perry Co. Floyd and Elizabeth Clum.

126. *Typha angustifolia* L. Broad-leaf Cat-tail. Lawrence Twp., Stark Co. Don M. Brown.

157.1. *Eleocharis tenuis* (Willd.) Schultes var. *verrucosum* Sv. Higby Prairie, Ross Co. Floyd Bartley.

170. *Cyperus filiculmis* Vah. Slender Cyperus. Oneida, Carroll Co. Don M. Brown.

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[1]Papers from the Department of Botany, The Ohio State University, No. 466.
[2]The Work of the Soviet Botanists. Science, Vol. 97, No. 2520. 1943.

175. *Cyperus erythrorhizos* Muhl. Red-rooted Cyperus. Jackson Lake, Jackson Co. Floyd Bartley.
218. *Carex canescens* L. Silvery Sedge. Yok Farm, Stark Co. Don M. Brown.
229. *Carex tribuloides* Wahl. Blunt Broom Sedge. Jefferson Twp., Clinton Co. E. E. Terrell, Jr.
230. *Carex cristatella* Britt. Crested Sedge. Paris Twp., Stark Co. Don M. Brown.
234. *Carex normalis* Mack. Larger Straw Sedge. New Franklin, Stark Co. Don M. Brown.
276. *Carex granularis* Muhl. Meadow Sedge. Yok Farm, Stark Co. Don M. Brown.
299. *Carex impressa* (Wright) Mack. Wright's Sedge. Morral, Marion Co. Don M. Brown.
300. *Carex lanuginosa* Mx. Woolly Sedge. Morral, Marion Co. Don M. Brown.
325. *Arundinaria gigantea* (Walt.) Chapm. Cane. Batavia, Clermont Co. M. B. Trautman via Edward S. Thomas.
341. *Festuca rubra* L. Red Fescue-grass. Paxton Twp., Ross Co. Floyd Bartley.
362. *Poa pratensis* L. Kentucky Blue-grass. Morral, Marion Co. Don M. Brown.
400. *Calamagrostis canadensis* (Mx.) Beauv. Bluejoint Reed Bentgrass. Marion Co. Clyde H. Jones.
409. *Cinna arundinacea* L. Wood Reed-grass. Stark Co. Don M. Brown.
409.1. *Cinna latifolia* (Trevir.) Griseb. Slender Wood Reed-grass. Ross Co. Gordon S. Crowl.
415. *Phleum pratense* L. Timothy. Fairfield Co. Charles R. Goslin.
417. *Muhlenbergia mexicana* (L.) Trin. Mexican Muhlenbergia. Columbiana Co. Don M. Brown.
419. *Muhlenbergia umbrosa* Scribn. Wood Muhlenbergia. Ross Co. Gordon S. Crowl.
421. *Muhlenbergia schreberi* Gmel. Spreading Muhlenbergia. Stark Co. Don M. Brown. Ross Co. Gordon S. Crowl.
422. *Brachyelytrum erectum* (Schreb.) Beauv. Brachyelytrum. Vernon Twp., Clinton Co. E. E. Terrell, Jr.
423. *Milium effusum* L. Tall Millet-grass. Pleasant Twp., Fairfield Co. Charles R. Goslin.
427. *Aristida dichotoma* Mx. Poverty-grass. Hocking Co. Don M. Brown.
428. *Aristida gracilis* Ell. Slender Triple-awned-grass. Guernsey Co. Emma E. Laughlin.
438. *Lolium multiflorum* Lam. Awned Darnel. Ross Co. Gordon S. Crowl.
438.1. *Agropyron cristatum* (L.) Beauv. Crested Wheat-grass. Franklin Co. Glenn W. Blaydes. Introduced.
442. *Triticum aestivum* L. Wheat. Y. M. C. A. Camp, Lake Co. Don M. Brown.
444. *Elymus virginicus* L. Virginia Wild-rye. Canal Fulton, Stark Co. Don M. Brown.
446. *Elymus canadensis* L. Nodding Wild-rye. Y. M. C. A. Camp, Lake Co. Don M. Brown.
447. *Elymus striatus* Willd. Slender Wild-rye. Clinton and Hamilton Co. E. E. Terrell, Jr.
448. *Hystrix hystrix* (L.) Millsp. Bottle-brush-grass. Wood Co. R. E. Shanks. Berne Twp., Fairfield Co. Charles R. Goslin.
449. *Hordeum vulgare* L. Common Barley. Wood's Cottage, Stark Co. Don M. Brown.
453. *Spartina michauxiana* Hichc. Tall Slough-grass. Canal Fulton, Stark Co. Don M. Brown. Tuscarawas Co. L. E. Hicks and Edward S. Thomas.
460. *Homalocenchrus virginicus* (Willd.) Britt. Virginia Cut-grass. Hocking Co. Don M. Brown.
461. *Homalocenchrus oryzoides* (L.) Poll. Rice Cut-grass. Wood Co. R. E. Shanks. Ross Co. Gordon S. Crowl.
463. *Zizania aquatica* L. Wild Rice. Lawrence Twp., Stark Co. Don M. Brown.
467. *Panicum dichotomiflorum* Mx. Spreading Panic-grass. Pike Co. Gordon S. Crowl. Stark Co. Don M. Brown.
471. *Panicum capillare* L. Tumble Panic-grass. Ross Co. Gordon S. Crowl.
483. *Panicum polyanthes* Schultes. Many-flowered Panic-grass. Jefferson Twp., Clinton Co. E. E. Terrell, Jr.
485. *Panicum microcarpon* Muhl. Small-fruited Panic-grass. Vernon Twp., Clinton Co. E. E. Terrell, Jr.
497. *Panicum latifolium* L. Broad-leaf Panic-grass. Yok Farm, Stark Co. Don M. Brown.
506. *Paspalum circulare* Nash. Round-fruited Paspalum. Vernon Twp., Clinton Co. E. E. Terrell, Jr.
514. *Holcus halapensis* L. Johnson-grass. Vernon Twp., Clinton Co. E. E. Terrell, Jr.
527. *Lilium canadense* L. Canadian Lily. Gallia Co. Clyde H. Jones.
527.1. *Lilium michiganense* Farwell. Michigan Lily. Marion Co. Clyde H. Jones.
530. *Erythronium americanum* Ker. Yellow Dog-tooth Lily. Perry Co. Floyd and Elizabeth Clum.
538. *Allium canadense* L. Meadow Garlic. Morral, Marion Co. Don M. Brown. Oxford, Butler Co. Clarence F. Clark.

541. *Quamasia hyacinthina* (Raf.) Britt. Wild Hyacinth. Rushcreek Twp., Fairfield Co. Charles R. Goslin.
556. *Trillium erectum* L. Ill-scented Trillium. Monroe Co. Clyde H. Jones.
557. *Trillium cernuum* L. Nodding Trillium. Butler Co. Clarence F. Clark.
563. *Uvularia sessilifolia* L. Sessile-leaf Bellwort. Portage Co. Clyde H. Jones.
569. *Polygonatum commutatum* (R. & S.) Dietr. Smooth Solomon's-seal. Oxford, Butler Co. Clarence F. Clark.
571. *Vagnera racemosa* (L.) Mor. Panicled Solomon's-seal. Monroe Co. Clyde H. Jones.
572. *Vagnera stellata* (L.) Mor. Stellate Solomon's-seal. Richland Twp., Clinton Co. E. E. Terrell, Jr.
574. *Unifolium canadense* (Desf.) Greene. False Lily-of-the-valley. Portage Co. Clyde H. Jones.
578. *Asparagus officinalis* L. Asparagus. Oxford, Butler Co. Clarence F. Clark.
587. *Tradescantia reflexa* Raf. Reflexed Spiderwort. Jasper Twp., Fayette Co. E. E. Terrell, Jr.
606. *Juncus brachycarpus* Engelm. Short-fruited Rush. Vernon Twp., Clinton Co. E. E. Terrell, Jr.
608. *Juncus acuminatus* Mx. Sharp-fruited Rush. Jefferson Twp., Clinton Co. E. E. Terrell, Jr.
620. *Dioscorea villosa* L. Wild Yam. Marion Co. Clyde H. Jones.
661. *Limodorum tuberosum* L. Limodorum. Thorn Twp., Perry Co. Floyd and Elizabeth Clum.
664. *Pogonia ophioglossoides* (L.) Ker. Rose Pogonia. Thorn Twp., Perry Co. Floyd and Elizabeth Clum.
671. *Corallorrhiza corallorrhiza* (L.) Karst. Early Coral-root. Franklin Co. Jane Roller.
680. *Asimina triloba* (L.) Dunal. Papaw. Thorn Twp., Perry Co. Floyd and Elizabeth Clum. Butler Co. Clarence F. Clark.
685. *Ranunculus pennsylvanicus* L. f. Bristly Buttercup. Canal Fulton, Stark Co. Don M. Brown.
690. *Ranunculus hispidus* Mx. Hispid Buttercup. Thorn Twp., Perry Co. Floyd and Elizabeth Clum.
706. *Delphinium tricorne* Mx. Dwarf Larkspur. Chester Twp., Clinton Co. E. E. Terrell, Jr. Monroe and Belmont Co. Clyde H. Jones.
713. *Anemone quinquefolia* L. Wind-flower. Thorn Twp., Perry Co. Floyd and Elizabeth Clum.
719. *Caltha palustris* L. Marsh-marigold. Adams Twp., Clinton Co. E. E. Terrell, Jr.
720. *Hydrastis canadensis* L. Golden-seal. Wood's Cottage, Stark Co. Don M. Brown.
737. *Podophyllum peltatum* L. May-apple. Athens, Athens Co. Warren Abbott. Clinton Twp., Wayne Co. E. P. MacArthur.
746. *Papaver dubium* L. Corn Poppy. Marion Co. Don M. Brown.
751. *Macleya cordata* (Willd.) R. Br. Plume-poppy. Franklin Co. L. E. Hicks. Cultivated.
752. *Stylophorum diphyllum* (Mx.) Nutt. Yellow Celandine-poppy. Pike Co. Gordon S. Crowl.
754. *Bicuculla cucullaria* (L.) Millsp. Dutchman's-breeches. Pike Co. Gordon S. Crowl. Marion Twp., Hocking Co. Charles R. Goslin.
759. *Capnoides flavulum* (Raf.) Ktz. Pale Corydalis. Adams Twp., Clinton Co. E. E. Terrell, Jr.
765. *Draba verna* L. Vernal Whitlow-grass. Pike Co. Gordon S. Crowl. Athens Co. Warren Abbott. Thorn Twp., Perry Co. Floyd and Elizabeth Clum.
766. *Draba cuneifolia* Nutt. Wedge-leaf Whitlow-grass. Pike Co. Floyd Bartley.
770. *Camelina microcarpa* Andrz. Small-fruited False-flax. Jasper Twp., Fayette Co. E. E. Terrell, Jr. Franklin Co. Don M. Brown.
771. *Bursa bursa-pastoris* (L.) Britt. Shepherd's-purse. Thorn Twp., Perry Co. Floyd and Elizabeth Clum.
773. *Armoracia armoracia* (L.) Britt. Horseradish. Tillerman Bog, Greenville, Darke Co. Dale W. Jenkins.
777. *Radicula palustris* (L.) Moench. Marsh Yellow-cress. Wood Co. R. E. Shanks. Morral, Marion Co. Don M. Brown.
778. *Radicula sylvestris* (L.) Druce. Creeping Yellow-cress. Clinton Co. E. E. Terrell, Jr. Canal Fulton, Stark Co. Don M. Brown.
786. *Thlaspi arvense* L. Field Penny-cress. Tillerman Bog, Greenville, Darke Co. Dale W. Jenkins.
789. *Alliaria alliaria* Britt. Garlic-mustard. Clinton Co. E. E. Terrell, Jr. Painesville, Lake Co. Fred J. Tyler and H. C. Beardsley.
790. *Sophia pinnata* (Walt.) Howell. Pinnate Tansy-mustard. Jasper Twp., Fayette Co. E. E. Terrell, Jr.
797. *Norta altissima* (L.) Britt. Tall Hedge-mustard. Morral, Marion Co. Don M. Brown.

802. *Barbarea barbarea* (L.) MacM. Yellow Winter-cress. Athens, Athens Co. Warren Abbott.
803. *Barbarea stricta* Andrz. Erect Winter-cress. Butler Co. Clarence F. Clark. Thorn Twp., Perry Co. Floyd and Elizabeth Clum.
805. *Iodanthus pinnatifidus* (Mx.) Steud. Purple Rocket. Ross Co. Gordon S. Crowl.
810. *Arabis laevigata* (Muhl.) Poir. Smooth Rock-grass. Ross Co. Gordon S. Crowl.
828. *Dentaria multifida* Muhl. Multifid Toothwort. Bishopville, Morgan Co. Betty Williams via Walter P. Porter.
845. *Cleoma spinosa* L. Spider-flower. Greenfield Twp., Fairfield Co. R. J. Goslin and J. L. Goslin.
868. *Linum virginianum* L. Virginia Flax. Perry, Lake Co. Fred J. Tyler.
873. *Impatiens biflora* Walt. Spotted Touch-me-not. Cecil, Paulding Co. Clarence F. Clark.
882. *Polygala viridescens* L. Purple Milkwort. Jefferson Twp., Clinton Co. E. E. Terrell, Jr.
902. *Tithymalus commutatus* (Engelm.) Kl. & Garcke. Tinted Spurge. Ash Cave, Hocking Co. Jane Roller.
936. *Hypericum ascyron* L. Great St. John's-wort. Canal Fulton, Stark Co. Don M. Brown.
948. *Hypericum drummondii* (Grev. & Hook.) T. & G. Drummond's St. John's-wort. Jefferson Twp., Clinton Co. E. E. Terrell, Jr.
963. *Viola canadensis* L. Canada Violet. Monroe Co. Clyde H. Jones.
964. *Viola eriocarpa* Schw. Smooth Yellow Violet. Wood's Cottage, Stark Co. Don M. Brown.
966. *Viola hastata* Mx. Halberd-leaf Yellow Violet. Canal Fulton, Stark Co. Don M. Brown.
967. *Viola striata* Ait. Striped Violet. Canton, Stark Co. Don M. Brown.
971. *Viola rafinesquii* Greene. Wild Pansy. Wayne Twp., Warren Co. E. E. Terrell, Jr.
981. *Viola sororia* Willd. Wooly Blue Violet. Adams Twp., Clinton Co. E. E. Terrell, Jr.
1004. *Alsine graminea* (L.) Britt. Lesser Stitchwort. Canton, Stark Co. Don M. Brown.
1015. *Lychnis alba* Mill. White Lychnis. Newton, Hamilton Co. E. E. Terrell, Jr.
1025. *Silene regia* Sims. Royal Catchfly. Urbana, Salem, Twp., Champaign Co. Jane Roller.
1038. *Claytonia virginica* L. Spring-beauty. Thorn Twp., Perry Co. Floyd and Elizabeth Clum.
1060. *Chenopodium album* L. Lamb's-quarter. Hocking Twp., Fairfield Co. Charles R. Goslin.
1063. *Chenopodium vulvaria* L. Fetid Goosefoot. Franklin Co. Robert Kavanagh. Introduced.
1080. *Steironema ciliatum* (L.) Raf. Fringed Yellow Loosestrife. Marion Co. Clyde H. Jones.
1104. *Tiniaria convolvulus* (L.) Webb. & Moq. Black Bindweed. Ross Co. Floyd Bartley.
1106. *Tiniaria dumetorum* (L.) Opiz. Copse False Buckwheat. Sippo Lake, Stark Co. Don M. Brown.
1118. *Persicaria muhlenbergii* (Wats.) Small. Swamp Persicaria. Liberty Twp., Clinton Co. E. E. Terrell, Jr.
1130. *Geum virginianum* L. Rough Avens. Marion Co. Clyde H. Jones.
1135. *Potentilla monspeliensis* L. Rough Cinquefoil. Y. W. C. A. Camp, Lake Co. Don M. Brown.
1136. *Potentilla recta* L. Upright Cinquefoil. Newton, Hamilton Co. E. E. Terrell, Jr.
1145. *Fragaria virginiana* Duch. Virginia Strawberry. Oxford, Butler Co. Clarence F. Clark.
1165. *Spiraea alba* Du Roi. Narrow-leaf Spiraea. Marion Co. Clyde H. Jones.
1205. *Aronia melanocarpa* (Mx.) Britt. Black Chokeberry. Clinton Twp., Wayne Co. E. P. MacArthur.
1207. *Amelanchier sanguinea* (Pursh.) DC. Roundleaf Juneberry. Lucas Co. Edward S. Thomas.
1208. *Crataegus crus-galli* L. Cockspur Hawthorn. Berne Twp., Fairfield Co. William Goslin.
1212. *Crataegus calpodendron* (Ehrh.) Medic. Pear Hawthorn. Geauga Co. Harry Crofoot and Fred J. Tyler.
1217. *Crataegus straminea* Beadle. Allegheny Hawthorn. Deercreek Twp., Pickaway Co. Floyd Bartley and Leslie L. Pontius.
1217.1. *Crataegus brumalis* Ashe. Geauga Co. Harry Crofoot and Fred J. Tyler.
1219.1. *Crataegus populnea* Ashe. Gruber's Hawthorn. Lake and Ashtabula Co. Fred J. Tyler.
1222. *Crataegus pruinosa* (Wendl.) Koch. Waxy-fruited Hawthorn. Portage Co. Harry Crofoot and Fred J. Tyler.

1228.1. *Crataegus milleri* Sarg. Miller's Hawthorn. Ashtabula, Lake Co. Fred J. Tyler and Harry Crofoot.
1228.3. *Crataegus kellermannii* Sarg. Kellerman's Hawthorn. Lake Co. Harry Crofoot and Fred J. Tyler.
1228.4. *Crataegus delecta* Sarg. Franklin Co. Fred J. Tyler.
1228.5. *Crataegus latisepala* Ashe. Lake Co. Fred J. Tyler.
1231. *Cercis canadensis* L. Redbud. Fairfield Co. William Goslin.
1232. *Gleditsia triacanthos* L. Honey-locust. Fairfield Co. William Goslin.
1234. *Cassia marilandica* L. Wild Senna. Canal Fulton, Stark Co. Don M. Brown.
1239. *Cassia leucantha* T. & G. Large White Wild-indigo. Marion Co. Clyde H. Jones.
1240. *Baptisia tinctoria* (L.) R. Br. Yellow Wild-indigo. Henry Co. R. E. Shanks.
1246. *Medicago lupulina* L. Hop Medic. Add for Fairfield, Hocking, Jackson, and Lake Co.
1248. *Trifolium agrarium* L. Yellow Hop Clover. Ross Co. Don M. Brown. Remove records for Morgan and Sandusky Co.
1249. *Trifolium procumbens* L. Low Hop Clover. Union Twp., Logan Co. A. G. Welshimer. Add for Morgan Co. Remove records for Van Wert, Lucas, and Geauga Co.
1250. *Trifolium dubium* Sibth. Least Hop Clover. Hocking Twp., Fairfield Co. Charles R. Goslin. Add for Coshocton, Hocking, and Jackson Co.
1261. *Cracca virginiana* L. Virginia Goat's-rue. Wood Co. R. E. Shanks.
1262. *Robinia pseudo-acacia* L. Common Locust. Fairfield Co. William Goslin.
1264. *Robinia hispida* L. Rose Acacia. Laurel Twp., Hocking Co. Charles R. Goslin.
1269. *Psoralea onobrychis* Nutt. Sainfoin Psoralea. Marion Co. Clyde H. Jones.
1273. *Meibomia canescens* (L.) Kuntze. Hoary Tick-trefoil. Wood Co. R. E. Shanks. Pike Co. Gordon S. Crowl.
1274. *Meibomia bracteosa* (Mx.) Ktz. Large-bracted Tick-trefoil. Adams Co. A. R. Harper, Gordon S. Crowl, and Edward S. Thomas.
1276. *Meibomia michauxii* Vail. Prostrate Tick-trefoil. Pike and Ross Co. Gordon S. Crowl. Harrison Twp., Henry Co. R. E. Shanks.
1280. *Meibomia canadensis* (L.) Ktz. Canadian Tick-trefoil. Canal Fulton, Stark Co. Don M. Brown. Fairfield Co. Charles R. Goslin.
1301. *Vicia villosa* Roth. Winter Vetch. Ripley, Brown Co. E. E. Terrell, Jr.
1313. *Lathyrus tuberosus* L. Tuber-bearing Pea. Highland Co. K. A. Shutts via C. J. Willard.
1335. *Tiarella cordifolia* L. False Miterwort. Portage Co. Clyde H. Jones.
1346. *Lythrum alatum* Pursh. Wing-angled Loosestrife. Scioto Co. Charles B. Wing.
1367. *Euonymus atropurpureus* Jacq. Wahoo. Belmont Co. Clyde H. Jones.
1370. *Euonymus obovatus* Nutt. Running Strawberry-bush. Oxford, Butler Co. Clarence F. Clark.
1379. *Aesculus glabra* Willd. Ohio Buckeye. Thorn Twp., Perry Co. Floyd and Elizabeth Clum.
1382.1. *Acer ginnala* Maxim. Ginnala's Maple. Lake Co. Harry Crofoot and Fred J. Tyler. Escaped.
1338. *Mitella diphylla* L. Two-leaf Bishop's-cap. Portage Co. Clyde H. Jones.
1410. *Urticastrum divaricatum* (L.) Ktz. Wood-nettle. New Franklin, Stark Co. Don M. Brown.
1431. *Quercus coccinea* Wang. Scarlet Oak. Geauga, Cuyahoga, and Henry Co. Ralph M. Kriebel.
1431.1. *Quercus ellipsoidalis* E. J. Hill. Hill's Oak. Lucas, Henry, and Fulton Co. Ralph M. Kriebel.
1431.2. *Quercus coccinea* Muench. var. *tuberculata* Sarg. Lucas Co. Ralph M. Kriebel. This variety was first reported for Ohio from Rush Twp., Scioto County by Conrad Roth in 1942, but due to an error in numbering appeared in the 1942 "Additions" as No. 1431.1.
1432. *Quercus borealis* var. *maxima* (Marsh.) Ashe. Northern Red Oak. Lucas Co. Ralph M. Kriebel.
1432.3. *Quercus shumardii* Buckley. Shumard's Oak. Ottawa, Lorain, and Lucas Co. Ralph M. Kriebel.
1432.4. *Quercus shumardii* var. *schneckii* (Britt.) Sarg. Schenck's Oak. Ottawa and Lorain Co. Ralph M. Kriebel.
1501.1. *Epilobium hirsutum* L. Great Hairy Willow-herb. Perry, Lake Co. Harry Crofoot.
1512. *Kneiffia fruticosa* (L.) Raim. Common Sundrops. Morral, Marion Co. Don M. Brown.
1558. *Polycodium stamineum* (L.) Greene. Deerberry. Pike Co. Gordon S. Crowl.
1559. *Vaccinium corymbosum* L. Tall Blueberry. Stark Co. Don M. Brown.
1561. *Vaccinium vacillans* Kalm. Low Blueberry. Henry Co. R. E. Shanks.
1565. *Oxycoccus macrocarpus* (Ait.) Pursh. Large Cranberry. Ashland Co. Edward S. Thomas.
1568. *Diospyros virginiana* L. Persimmon. Lawrence Co. M. T. Vermillion. Franklin Co. L. E. Hicks.

1571. *Polemonium reptans* L. Greek Valerian. Athens, Athens Co. Warren Abbott. Laurel Twp., Hocking Co. Charles Goslin. Butler Co. Clarence F. Clark.
1578. *Phlox pilosa* L. Downy Phlox. Holmes Co. E. P. MacArthur.
1579. *Phlox divaricata* L. Wild Blue Phlox. Holmes Co. E. P. MacArthur. Pike Co. Gordon S. Crowl. Athens, Athens Co. Warren Abbott. Perry Co. Floyd and Elizabeth Clum.
1582. *Phlox subulata* var. *ciliata* Wherry. Northern Ground Phlox. Holmes Co. E. P. MacArthur.
1582a. *Phlox subulata* var. *australis* Wherry. Southern Ground Phlox. York Twp., Athens Co. Warren Abbott.
1583. *Ipomoea purpurea* (L.) Lam. Common Morning-glory. Fairfield Co. William Goslin.
1584. *Ipomoea hederacea* Jacq. Ivy-leaf Morning-glory. Fayette Co. Fred H. Norris.
1588. *Convolvulus arvensis* L. Field Bindweed. Salem Twp., Meigs Co. Clyde H. Jones.
1590. *Convolvulus sepium* L. Hedge Bindweed. Clay Twp., Perry Co. Charles Reutinger. New Franklin, Stark Co. and Y. W. C. A. Camp, Lake Co. D. M. Brown.
1592. *Convolvulus fraterniflorus* Mack. & Bush. Short-stalked Bindweed. Pike Co. Gordon S. Crowl.
1597. *Cuscuta polygonorum* Engelm. Smartweed Dodder. Berne Twp., Fairfield Co. Charles R. Goslin. Belmont Co. Emma E. Laughlin.
1601. *Cuscuta gronovii* Willd. Gronovius' Dodder. Canal Fulton, Stark Co. Don M. Brown.
1614. *Chionanthus virginica* L. Fringe-tree. Adams Co. A. R. Harper.
1618. *Fraxinus lanceolata* Borck. Green Ash. Marion Co. Clyde H. Jones.
1636. *Apocynum androsaemifolium* L. Spreading Dogbane. Salem Twp., Champaign Co. Jane Roller.
1653. *Asclepias quadrifolia* Jacq. Fourleaf Milkweed. Vernon Twp., Clinton Co. E. E. Terrell, Jr.
1669. *Physalis virginiana* Mill. Virginia Ground-cherry. Canal Fulton, Stark Co. Don M. Brown. Salem Twp., Champaign Co. Jane Roller.
1693. *Chelone montana* var. *elatior* (Raf.) P. & W. Mountain Turtle-head. Pike Co. Floyd Bartley.
1696. *Collinsia verna* Nutt. Blue-eyed-Mary. Monroe Co. Clyde H. Jones.
1699. *Leucospora multifida* (Mx.) Penn. Leucospora. Vernon Twp., Clinton Co. E. E. Terrell, Jr.
1719. *Veronica chamaedrys* L. Bird's-eye Speedwell. Ink Park, Canton, Stark Co. Don M. Brown.
1726. *Veronica serpyllifolia* L. Thyme-leaf Speedwell. Wood's Cottage, Stark Co. Don M. Brown.
1788. *Verbena hastata* L. Blue Vervain. Marion Co. Clyde H. Jones.
1793. *Lippia lanceolata* Mx. Frog-fruit. Canal Fulton, Stark Co. Don M. Brown.
1798. *Teucrium canadense* L. American Germander. Salem Twp., Campaign Co. Jane Roller. Canal Fulton, Stark Co. Don M. Brown.
1803. *Scutellaria incana* Muhl. Downy Skullcap. Vernon Twp., Clinton Co. E. E. Terrell, Jr.
1807. *Scutellaria parvula* Mx. Small Skullcap. Union Twp., Clinton Co. and Jasper Twp., Fayette Co. E. E. Terrell, Jr.
1812. *Mentha spicata* L. Spearmint. Carroll Co. Don M. Brown.
1836. *Clinopodium vulgare* L. Field Basil. Wood's Cottage, Stark Co. Don M. Brown.
1846. *Glecoma hederacea* L. Ground-ivy. Thorn Twp., Perry Co. Floyd and Elizabeth Clum.
1851. *Stachys palustris* L. Marsh Hedge-nettle. Salem Twp., Champaign Co. Jane Roller.
1853. *Stachys aspera* Mx. Rough Hedge-nettle. Lawrence Twp., Stark Co. Don M. Brown.
1859. *Lamium purpureum* L. Red Henbit. Adams Twp., Clinton Co. E. E. Terrell, Jr.
1860. *Lamium maculatum* L. Spotted Henbit. Allen Co. Franz Illing.
1867. *Monarda fistulosa* L. Wild Bergamot. Y. M. C. A. Camp, Lake Co. Don M. Brown.
1879. *Plantago cordata* Lam. Heartleaf Plantain. Crane Twp., Wyandot Co. Marguerite Lowery.
1902. *Deringa canadensis* (L.) Ktz. Honewort. Pike Co. Gordon S. Crowl. New Franklin, Stark Co. Don M. Brown.
1950. *Houstonia angustifolia* Mx. Narrow-leaf Houstonia. Adams Co. E. E. Terrell, Jr.
1952. *Mitchella repens* L. Partridge-berry. Mohican Forest, Ashland Co. James Stevenson. Richland Twp., Holmes Co. E. P. MacArthur.
1957. *Galium pilosum* Ait. Hairy Bedstraw. Y. M. C. A. Camp, Lake Co. Don M. Brown.
1982. *Viburnum prunifolium* L. Black Haw. Thorn Twp., Perry Co. Floyd and Elizabeth Clum.
1986. *Triosteum perfoliatum* L. Common Horse-gentian. Greenfield Twp., Fairfield Co. Charles R. Goslin.
1997. *Lonicera glaucescens* Rydb. Glaucesent Honeysuckle. Ashtabula Co. Harry Crofoot.
1999. *Lonicera sullivantii* Gr. Sullivant's Honeysuckle. Salem Twp., Champaign Co. Jane Roller.
2019. *Lobelia inflata* L. Indian-tobacco. Ross Co. Gordon S. Crowl.

2021. *Lobelia spicata* L. Pale Spiked Lobelia. Geauga Co. E. P. MacArthur.
2024. *Xanthium pennsylvanicum* Wallr. Pennsylvania Cocklebur. Hocking and Fairfield Co. Charles R. Goslin.
2029. *Ambrosia elatior* L. Roman Ragweed. Berne Twp., Fairfield Co. William and Robert Goslin.
2033. *Rudbeckia hirta* L. Black-eyed Susan. Vinton Co. A. G. Welshimer.
2036. *Rudbeckia sullivanti* Boynt. and Bead. Sullivant's Cone-flower. Adams Co. Edward S. Thomas.
2045. *Helianthus giganteus* L. Giant Sunflower. Highland Co. Katie M. Roads.
2055. *Helianthus decapetalus* L. Thinleaf Sunflower. Ross Co. Gordon S. Crowl.
2057. *Helianthus strumosus* L. Paleleaf Wood Sunflower. Highland Co. Katie M. Roads.
2060. *Helianthus hirsutus* Raf. Hirsute Sunflower. Highland Co. Katie M. Roads.
2071. *Bidens comosa* (Gray) Wieg. Leafy-bracted Bur-marigold. Clinton Co. E. E. Terrell, Jr. Fairfield Co. Charles R. Goslin.
2077. *Bidens vulgata* Greene. Tall Beggar Ticks. Athens, Athens Co. Warren Abbott.
2079. *Bidens frondosa* L. Black Beggar-ticks. Franklin Co. A. R. Harper and Edward S. Thomas.
2080. *Bidens bipinnata* L. Spanish-needles. Laurel Twp., Hocking Co. Charles R. Goslin. Ross Co. Gordon S. Crowl.
2088. *Polymnia canadensis* L. Small-flowered Leaf-cup. Portage Co. Don M. Brown.
2092. *Silphium perfoliatum* L. Indian-cup. Wood Co. R. E. Shanks.
2093. *Silphium trifoliatum* L. Whorled Rosin-weed. Marion Co. Clyde H. Jones.
2097. *Helenium nudiflorum* Nutt. Purple-headed Sneezeweed. Fairfield Co. E. E. Terrell, Jr. Gallia Co. Clyde H. Jones.
2103. *Inula helenium* L. Elecampane. Stark Co. Don M. Brown.
2110. *Anaphalis margaritaceae* (L.) Gray. Pearly Everlasting. Athens, Athens Co. Warren Abbott.
2112. *Antennaria plantaginifolia* (L.) Rich. Plantain-leaf Everlasting. Holmes Co. E. P. MacArthur.
2114. *Antennaria neodioica* Greene. Smaller Everlasting. Pike Co. Gordon S. Crowl.
2116.2. *Grindellia lanceolata* Nutt. Narrow-leaf Gum-plant. Vore Ridge, Athens Co. Walter P. Porter and P. S. Wamsley.
2121. *Solidago hispida* Muhl. Hairy Goldenrod. Pike Co. Gordon S. Crowl.
2123. *Solidago caesia* L. Wreath Goldenrod. Laurel Twp., Hocking Co. Charles R. Goslin. Pike Co. Gordon S. Crowl.
2130. *Solidago canadensis* L. Canada Goldenrod. Highland Co. Katie M. Roads.
2134. *Solidago ulmifolia* Muhl. Elmleaf Goldenrod. Odell Creek Sanctuary, Friendship, Scioto Co. R. B. Gordon, J. S. Katz, and F. B. Chapman.
2137. *Solidago juncea* Ait. Plume Goldenrod. Fairfield Co. Charles R. Goslin. Buckeye Lake, Licking Co. Warren Abbott. Ross Co. Gordon S. Crowl.
2145. *Seriococarpus asteroides* (L.) B. S. P. Toothed White-top Aster. Adams Co. E. E. Terrell, Jr.
2148. *Aster schreberi* Nees. Schreber's Aster. Ross Co. Gordon S. Crowl.
2149. *Aster macrophyllus* L. Largeleaf Aster. Pike Co. Gordon S. Crowl.
2154. *Aster lindleyanus* T. & G. Lindley's Aster. Athens, Athens Co. Warren Abbott.
2155. *Aster sagittifolius* Willd. Arrowleaf Aster. Stark Co. Don M. Brown.
2157. *Aster undulatus* L. Wavy-leaf Aster. Adams Co. Fred H. Norris.
2158. *Aster puniceus* L. Purple-stem Aster. Green Twp., Ross Co. Floyd Bartley.
2160. *Aster novae-angliae* L. New England Aster. Logan Co. A. G. Welshimer. Clinton Co. E. E. Terrell, Jr.
2180. *Erigeron ramosus* (Walt.) B. S. P. Daisy Fleabane. Yok Farm, Stark Co. Don M. Brown.
2186. *Ionactis linariifolius* Greene. Stiffleaf Aster. Madison Twp., Fairfield Co. Gene and Helen Rea.
2188. *Eupatorium purpureum* L. Purple Joe-Pye-Weed. Vernon Twp., Clinton Co. E. E. Terrell, Jr.
2231. *Senecio aureus* L. Golden Squaw-weed. Ashland Co. Clyde H. Jones.
2250. *Cirsium odoratum* (Muhl.) Britt. Fragrant Thistle. New Franklin, Stark Co. Don M. Brown.
2259. *Centaurea maculosa* Lam. Spotted Star-thistle. Green Twp., Clinton Co. E. E. Terrell, Jr.
2270. *Apargia autumnale* (L.) Hoffm. Fall Hawkbit. Franklin Co. Clyde H. Jones.
2277. *Hieracium gronovii* L. Gronovius' Hawkweed. Jefferson Twp., Clinton Co. E. E. Terrell, Jr.
2284. *Hieracium venosum* L. Veined Hawkweed. Vernon Twp., Clinton Co. E. E. Terrell, Jr.
2309. *Leontodon taraxacum* L. Dandelion. Thorn Twp., Perry Co. Floyd and Elizabeth Clum.

DESCRIPTIONS OF THE NEOTYPE OF DRAECULACEPHALA MOLLIPES (SAY) AND A NEW SPECIES PREVIOUSLY CONFUSED WITH IT

(Homoptera, Cicadellidae)

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For many years the green and yellow sharp-headed leafhopper, *Draeculacephala mollipes* (Say), has been recognized as one of our common and abundant grass-feeding species in pastures, meadows and on certain of the cultivated grass crops. Recent studies of the genital structures of the males of this group have shown that a second common species described and illustrated herewith as *constricta* has been confused with *mollipes* because of their superficial resemblance. In view of the fact that the type specimens of *mollipes* have been destroyed, it has been necessary to designate which of these species should bear the name *mollipes*. The original description of *mollipes* would fit either species so we have agreed on the designation of the specimens described and illustrated at this time as *mollipes* (Say). We arrived at this decision after careful study of the male genital characters of large series of specimens previously identified as this species. A neotype is, therefore, being erected to serve as a future type for the species. A taxonomic revision of the entire genus has been completed and has been submitted for publication.

Draeculacephala mollipes (Say)

Tettigonia mollipes Say, Jour. Acad. Nat. Sci. of Phila. 6 : 312, 1831.

A yellow and green species with acutely angled vertex and without distinct markings. Length male 6 mm., female 7.5–8 mm.

Vertex produced, apex blunt, as long as or slightly longer than basal width and slightly longer than pronotum.

Color: Vertex, anterior portion of pronotum and scutellum yellow, posterior portion of pronotum and elytra dark green. Vertex faintly marked with narrow brownish lines.

Genitalia: Female last ventral segment with posterior margin concavely roundedly produced either side of a median produced rounded apex. Male plates long, concavely tapered to narrow, rounded divergent apices. Styles short, rather broad at middle, apical portion bent inwardly, and outer margin concavely rounded to pointed apex. The ventro-anterior portion of aedeagus with a pair of rather short, thick, dorsally directed processes and a pair of long, spine-like ventral processes which diverge and extend caudally to tip of aedeagus with their apices curved dorsally. Dorso-posterior portion with a pair of dorsally directed divergent processes and a ventral process which in ventral view appears elongate, about one-third as wide as long with narrow base and narrow bluntly pointed apex.

A male specimen from Hocking County, Ohio, collected August 25, 1935, by Dr. J. S. Caldwell, is designated as the neotype and a female from the same locality as the neallotype. Male and female specimens in the series are designated paratypes. All types deposited in the authors' collections.

Data from labelled specimens authentically identified as this species indicates the following distribution by states: Maine, New York, Pennsylvania, Ohio, Indiana, Illinois, Tennessee, Missouri, Wisconsin, Minnesota and Ontario, Canada.

Draeculacephala constricta n. sp.

Resembling *mollipes* in size, form and color but with distinct male genitalia. Length male 6.5 mm., female 8 mm.

Vertex produced and bluntly angled, in both sexes as long as basal width and slightly shorter than pronotum.

Color: Vertex, anterior portion of pronotum and scutellum yellow, vertex marked with faint brownish longitudinal lines. Posterior portion of pronotum and elytra dark green, veins paler.

Genitalia: Female last ventral segment produced from lateral angles, concave either side of median produced apex which is bluntly pointed. Male plates long, reaching to tips of pygofers, concavely narrowed to acute rounded apices. Styles short, broad at middle, apical portion bent inwardly, narrowed to pointed apices. Ventro-anterior portion of aedeagus with a pair of dorsally directed basal processes and a ventral pair of posteriorly directed divergent spine-like structures which extend almost to end of aedeagus and have apices which bend upward. Dorso-posterior portion with a pair of dorsally directed processes and a ventral portion which is elongate, narrowed at base, convexly rounded to almost one-half its width and with apex broadly rounded. In lateral view it is decidedly constricted just before base.

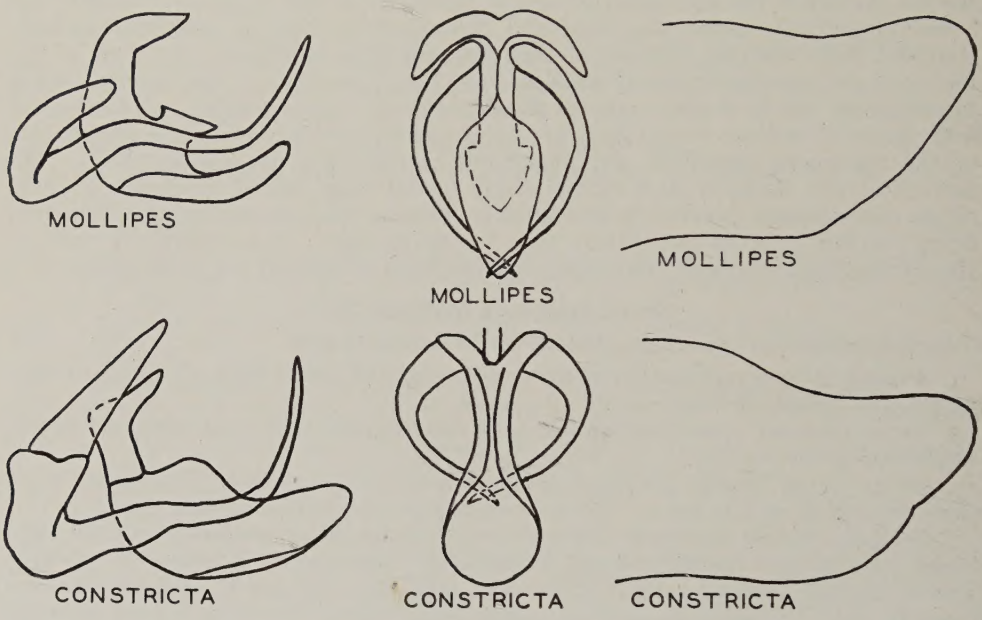

FIG. 1. Lateral and ventral views of the aedeagi, and lateral views of the pygofers.

Holotype male, allotype female and male and female paratypes from Washington County, Ohio, Oct. 12, 1940, collected by the senior author and deposited in the authors' collections. Male and female paratypes from Vandalia, Ohio, June 10, 1934 (Davidson); Northeast, Penn., June 15, 1917 (DeLong) in the Ohio State University collection. A large series of male and female paratypes collected at a light in Athens, Ohio, June 2, 1934 (W. C. Stehr) and deposited in the University of Minnesota collection. A large series of male and female paratypes deposited in the Illinois Natural History Survey collection are from the following localities in Illinois: St. Joseph, Fulton, Pike, Alton, Springfield, Princeton, Oquawka, Loda, Monmouth, Danville, Shawneetown, Havana, Pulaski, Apple River Canyon, Macomb, Anna, Oakwood, Urbana, Castle Rock, Beach, Evergreen Park, Dixon, Savannah, Wauconda, Hanover, Algonquin, Decatur, Thomson, Champaign, Zion, St. Anne, Dubois, Oak Lawn, Seymour, Kankakee, Dixon Springs, Parker, Warren, Weldon Springs, Dongola, Marshall, McHenry, Carbondale, Mt. Carmel, Metropolis, Grafton, Barry, Amboy, Vienna, Orangeville, Sheffield and Putnam.

Other areas from which this species has been taken are Maine, New York, New Jersey, Virginia, West Virginia, Kentucky, Tennessee, Indiana, Michigan, Wisconsin, Iowa, Missouri, Oklahoma, Texas, Florida, Kansas, Nebraska, South Dakota, Minnesota, Montreal, Quebec; and Banff, Alberta, Canada.